17 SUREFIRE Clamping Tips

AMERICAN WOODWORKER®

#89 October 2001
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18 Pro Tips on

- What to look for
- Mistakes to avoid
- Getting the best deal

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- Cutting Capacity at 90°: 3⅛"
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- All Sealed Ball Bearings
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- Max. Cutting Height: 13⅞"
- Table Tilt: 45° right, 10° left
- Blade Speed: 3,500 F.P.M.
- Blade Length: 154½"
- Approx. Ship. Weight: 613 lbs.

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26½" Resaw Bandsaw

NEW

- Motor: 7½ H.P., 220V
- Table height: 36½"
- Table tilts to 45°
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Rated "Best Instruction Manual" in a Hollow Chisel comparison by American Woodworker - February 1998

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- Unique swivel base
- Approx. Ship. Weight: 90 lbs.

Patent Pending

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G7943
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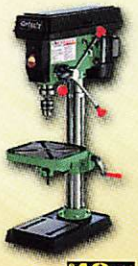
- Swing: 14"
- Drill Chuck: ⅝"
- Spindle Taper: MT #2
- Spindle Travel: 3¼"
- Speeds: 12, 140-3,050 R.P.M.
- Motor: ¾ H.P., 110V
- Approx. Ship. Weight: 160 lbs.



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G7946
5 Speed Floor Radial Drill Press

- Swing: 34"
- Drill Chuck: ⅝"
- Spindle Taper (Ext.): JT #33
- Spindle Travel: 3¼"
- Speeds: 5, 550-3,470 R.P.M.
- Motor: ½ H.P., 110V
- Approx. Ship. Weight: 150 lbs.

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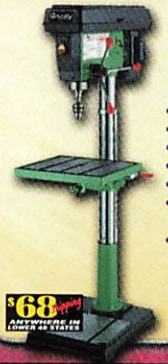
G7948
12 Speed 20" Floor Drill Press

- Swing: 20"
- Drill Chuck: ⅝"
- Spindle Taper: MT#4
- Spindle Travel: 4¾"
- Speeds: 12, 210-3,300 R.P.M.
- Motor: 1½ H.P., Single-Phase, 110V/220V
- Approx. Ship. Weight: 312 lbs.



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- Table Size: 20¼" x 18"
- ½" & ¾" Interchangeable Spindles
- 3" Spindle Travel
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- Motor: Heavy-Duty 1½ H.P., 110/220V
- Approx. Ship. Weight: 220 lbs.

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SALE PRICE
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Shown With Optional Wing

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G8794 12½" Portable Planer

- Motor: 2 H.P., Single-Phase 110V
- Max. Cutting Width: 12½"
- Max. Cutting Depth: 1/16"
- Max. Cutting Height: 6"
- Min. Board Thickness: 3/16"
- Feed Rate: 25 F.P.M.
- 57 cuts per inch
- Cutterhead R.P.M.: 8,540
- Approx. Ship. Weight: 85 lbs.

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FREE! 700 lb. Capacity Tool Stand! w/purchase of G8794 (a $54.95 Value!)

ONLY **$279.95**

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- Max. Cutting Width: 14⅞"
- Max. Cutting Depth: ⅛"
- Max Cutting Height: 6⅛"
- 3 H.S.S. Knife Cutterhead
- Feed Rate: 16 F.P.M. & 20 F.P.M.
- Includes Jackscrew & Spring Loaded Knife Setting
- Cutterhead R.P.M.: 5,000
- Motor: 3 H.P., Single-Phase 220V
- Approx. Ship. Weight: 540 lbs.

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G7297 12" Disc Sander

- 1 H.P. Motor, 110V
- Safety Toggle on/off switch
- 17¼" x 8¼" Aluminum Table
- Cast Iron Base with Built-In Dust Port
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This is a Super Deal!
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G1014Z Combination Sander 6" x 48"– 9" Disc

- Cast Iron Table, Disc & Body
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- 1725 R.P.M. spindle speed
- Motor: Heavy-duty 1 H.P. 110/220V
- Built-in 4" dust collection port
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Includes 10 Spindle Sizes!

Wood Magazine Editors' Choice Best Value

ONLY **$525.00**

$68 Anywhere in Lower 48 States

G8027 1 H.P. Dust Collector

- Motor Size: 1 H.P., Single-Phase
- Portable Base Size: 15" x 25½"
- Number of 4" Intake Holes: 1
- Air Suction Capacity: 500 C.F.M.
- Motor Amp Draw: 14 Amps (at 110V)
- Approx. Ship. Weight: 79 lbs.

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Best New Tool 1999

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G1029 2 H.P. Dust Collector

Includes a FREE 2-Stage Cyclone Separator (a $299 Value!)

- Portable Base Size: 21½" x 33½"
- Air Suction Capacity: 1550 C.F.M.
- Motor Size: 2 H.P., Single-Phase, 220V
- Standard Bag Filtration: 30 Micron
- Motor Amp Draw: 12 Amps (220V)
- Approx. Ship. Weight: 130 lbs.

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1998 Wood Magazine Outstanding Value Top Value

REG. $279.95
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G9958 4 H.P. Dust Collector

- Motor size: 4 H.P., Single-Phase, 220V
- Air suction capacity: 3560 C.F.M.
- Intake port without manifold: 9"
- Intake port with manifold: 4 x 4"
- Switch type: Magnetic
- Base size: 24"W x 69"L
- Approx. Ship. Weight: 320 lbs.

NEW

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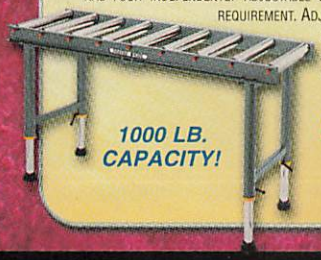
G8982 SHOP FOX® Roller Table

Use these versatile roller tables wherever you need extra workpiece support. Features all-steel welded construction and measures 19" x 65" long. Comes with 9 ball bearing rollers and has four independently adjustable legs for any leveling requirement. Adjustable in height from 26⅜" to 44⅛". Approx. Ship. weight: 89 lbs.



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G1182Z 6" x 47" Heavy-Duty Jointer

- Table size: 6" x 47"
- ½" Rabbeting Capacity
- Heavy-duty One Piece Steel Stand w/Built in Chip Chute
- Re-designed Fence System Positive stops @ 45° & 90°
- Motor: 1 H.P., Single-Phase, 110/220V (Pre-wired to 110 V)
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Includes a Free Pair of Safety Push Blocks PLUS a Free Dust Hood!

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ONLY **$395.00**

G1495 Heavy-Duty Wood Lathe

- Swing Over Bed: 14"
- Dist. Between Centers: 40"
- Spindle Taper: M.T. #2
- Swing Over Gap: 17"
- Spindle Size: 1" x 12 T.P.I. R.H.
- Tailstock Taper: M.T. #2
- Indexed spindle - 30°
- 7 Speeds: 500 - 3070 R.P.M.
- Motor: ¾ H.P., Single-Phase, 110V/220V
- Approx. Ship. Weight: 279 lbs.

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The high-output Cummins churns out 505 lb-ft of trailer-towing torque. Since its power heats up early and never seems to quit, the Cummins Turbo Diesel is ideal for slow roasting lesser trucks on a long, steep grade.

*If you like cooking with gas, we suggest the Magnum V-10. It was the very first 10-cylinder engine available in a pickup. And with a searing 310 horsepower and 450 lb-ft of torque, it's still the most powerful V-10.**

★★★★★

Five-Star Rating

The 1500 Regular Cab has received the highest government frontal crash test rating for both driver and front passenger. Yet another way Dodge Ram is different.

Dodge Ram

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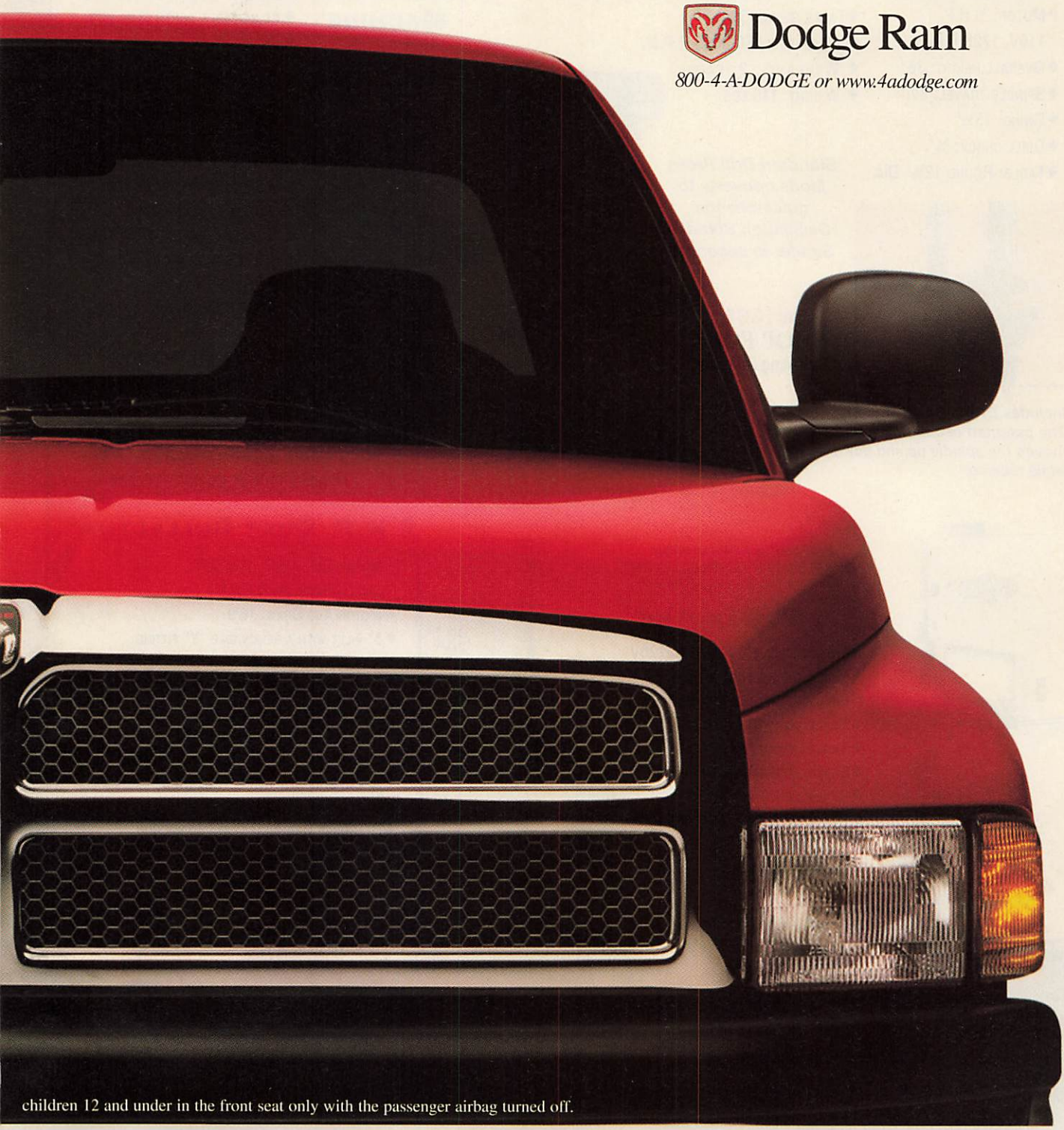


children 12 and under in the front seat only with the passenger airbag turned off.

INNOVATIVE PRODUCTS

QUALITY MACHINES DESIGNED FOR PRACTICAL USE

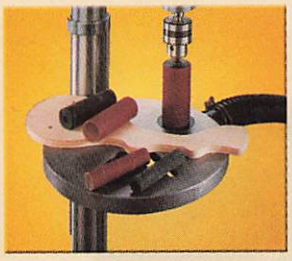
SHOP FOX®

***New**, from the maker of the famous Shop Fox® Mobile Bases and Table Saw Fences is this partial line-up of fine woodworking machines. Whether it is the patented oscillating drum sanding feature on the drill press or the patent pending mortising machine, Shop Fox® machines are designed for exceptional value.*

SEE THESE FINE MACHINES AT A DEALER NEAR YOU!

OSCILLATING DRILL PRESS

- MOTOR: ¾ H.P. 110V, 1725 R.P.M.
- OVERALL HEIGHT: 38"
- SPINDLE TRAVEL: 3¼"
- SWING: 13¼"
- DRILL CHUCK: ⅝"
- TABLE: ROUND 12⅜" DIA.
- TABLE SWING: 360°
- 12 SPEEDS: 250-3050 R.P.M.
- WARRANTY: 2 YEARS
- WEIGHT: 115 LBS.



Standard Drill Press Mode converts to quick-change Oscillation Spindle Sander in seconds!

W1668
SHOP FOX®
Oscillating Drill Press

Includes DRUM SANDER SET
The patented oscillating feature moves the spindle up and down while rotating.

MORTISING MACHINE

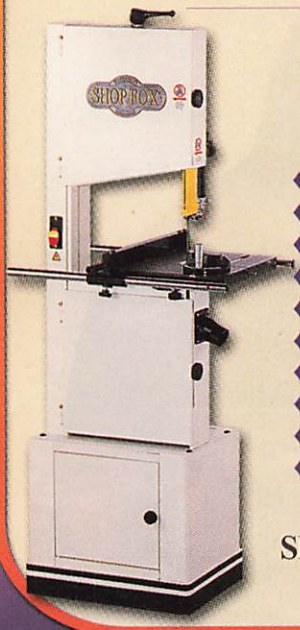
- MOTOR: ¾ H.P., 3450 R.P.M.
- ADJUSTABLE DEPTH STOP ROD
- UNIQUE SWIVELING BASE

PATENT PENDING

- HYDRAULIC CYLINDER FOR SOFTER RELEASES
- 6" x 16" WOOD TABLE
- MORTISE TO THE CENTER OF A 8" WIDE BOARD
- MORTISE LUMBER TO 8¾" THICK
- HEAVY CAST IRON CONSTRUCTION
- WARRANTY: 2 YEARS
- WEIGHT: 90 LBS.

W1671
SHOP FOX®
Mortising Machine

The unique SWIVELING BASE allows easy off the bench operations and opens new possibilities for custom mortises.



Features the patent pending QUICK BLADE TENSION LEVER

16" BANDSAW

- MOTOR SIZE: 1½ H.P. 110/220V
- MAX. CUTTING WIDTH: 15½"
- MAX. CUTTING HEIGHT: 8½"
- TABLE SIZE: 16" x 16"
- TABLE HEIGHT: 42"
- BLADE SIZE RANGE: ¼" - 1¼"
- BLADE LENGTH: 115"
- BLADE SPEEDS: 2300/3300 F.P.M.
- WARRANTY: 2 YEARS
- WEIGHT: 250 LBS.

W1673
SHOP FOX®
16" Bandsaw

2 H.P. DUST COLLECTOR

- MOTOR SIZE: 2 H.P., 110/220V, SINGLE-PHASE, 3450 R.P.M.
- MOTOR AMP DRAW: 18/9
- 5" INLET WITH A REMOVABLE "Y" FITTING WITH (2) 4" OPENINGS
- PORTABLE BASE SIZE: 21½" x 33½"
- BAG VOLUME: 5.4 CUBIC FEET
- HEIGHT (WITH BAGS INFLATED): 78"
- BAG SIZE (DIA. x DEPTH): 19" x 33" (2)
- AIR SUCTION CAPACITY: 1550 C.F.M.
- STATIC PRESSURE: 12.3"
- STANDARD BAG FILTRATION: 30 MICRON
- WARRANTY: 2 YEARS
- WEIGHT: 130 LBS.

W1666
SHOP FOX®
2 H.P. Dust Collector

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2 YEAR WARRANTY

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Cover photo by Bill Zuehlke

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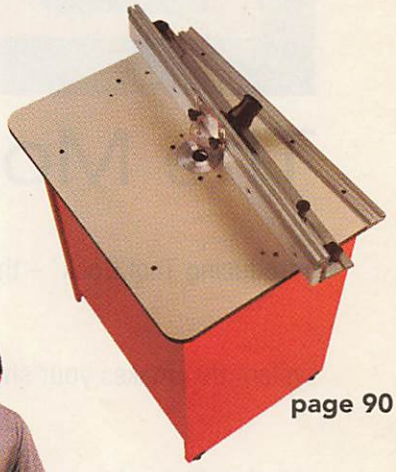

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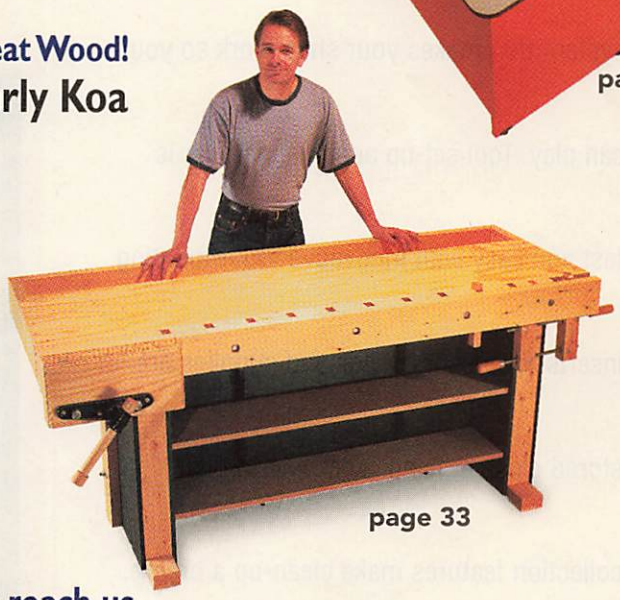

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How to reach us

We welcome your comments, suggestions, or complaints. Write to us at:
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Edited by **Dave Munkittrick**

Question & Answer

ART DIRECTION: VERN JOHNSON and BARBARA PEDERSON • PHOTOGRAPHY: STAFF

Clean Up Squeeze Out

Q. I saw one of those woodworking wizards on television the other day. As I watched the guy build a three-day project in 30 minutes, I noticed he washed off glue squeeze out with a wet cloth immediately after clamping. Won't the water weaken the glue joint?

Jon W. Von See
Denham Springs, LA

A. We went right to the folks who manufacture Tite-Bond glue to help us answer your question. Here's what we found out:

Don't try to rub the glue off with a wet rag. This will probably spread the glue around, water it down and sometimes force the diluted glue down into the joint.

It's better to use a damp 3M Scotch-Brite pad or synthetic steel wool. Both pick up the glue without spreading it around. Keep the pad in a bowl of water while you glue up your boards. Then, hold the pad up by a corner so all the excess water drains out. Wipe the glue with the damp pad using short, rolling strokes. Use a clean part of the pad for each stroke. The rolling motion creates a scraping action that lifts the glue off the wood rather than rubbing it in. Refresh a glue-soaked pad by rinsing it out in water.

Stick with this method and you'll avoid any problems with forcing watery glue into the joint or the pores of the surrounding wood. And don't believe everything you see on TV!

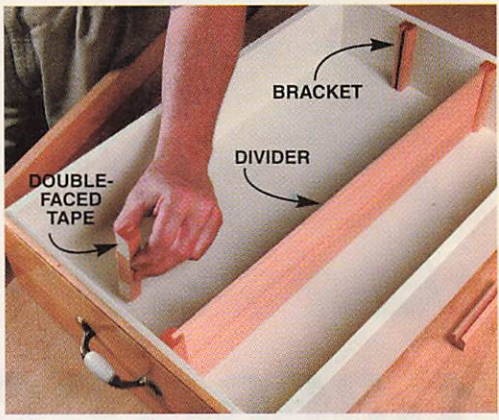
Easy Drawer Dividers

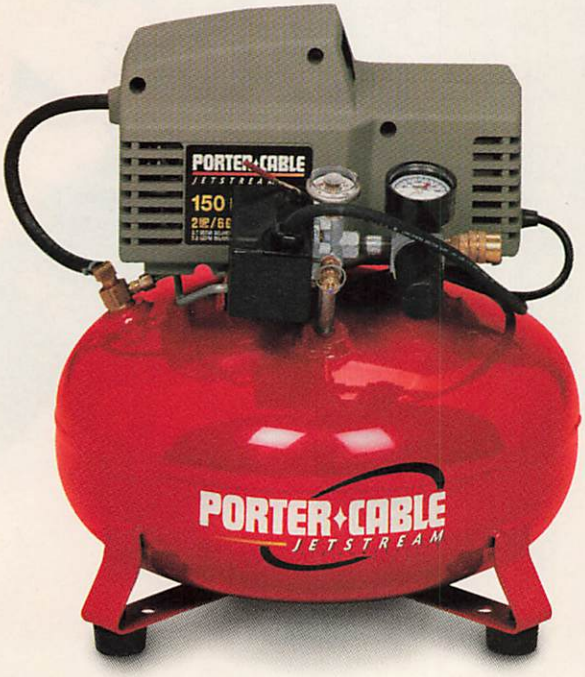
Q. Help! The junk drawer in our kitchen is out of control! I have trouble finding anything in there. Is there a simple way to add dividers to my kitchen drawers without taking them apart?

Sue Becker
Sandalwood, FL

A. You bet! Here's a way to control the clutter in less time than it takes to find the potato peeler.

To make the brackets that hold the dividers in place, groove the edge of a 3/4-in.-thick board on your router table and round over the outside edges. Then rip the grooved edge off the board and crosscut to length. I like to attach the brackets with double-faced tape or a little hot-melt glue. That way you can reposition them to suit your ever-changing collection of kitchen junk.





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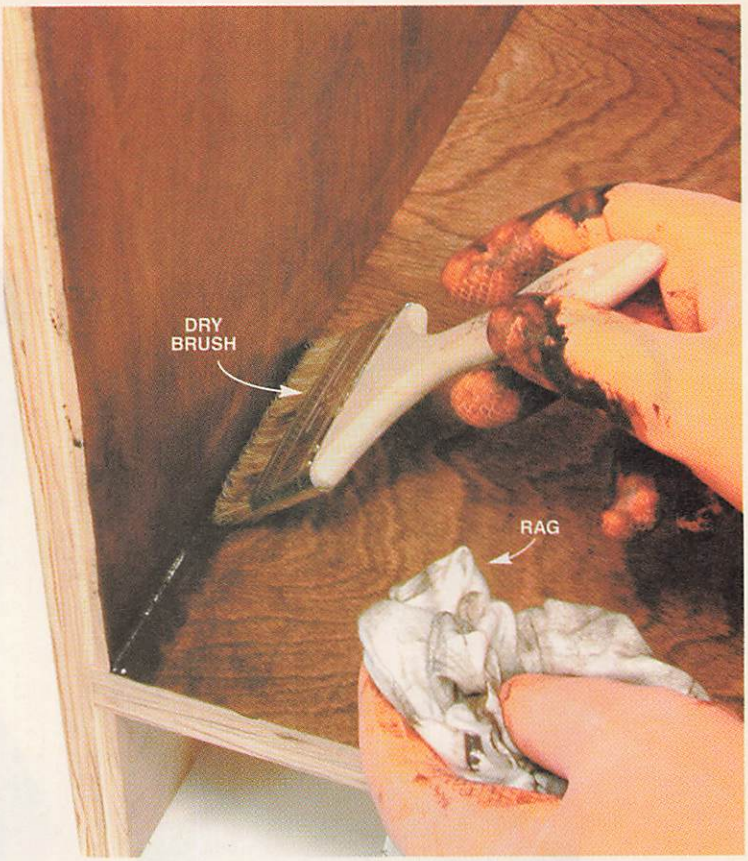
Question & Answer

Getting Stain Out of Corners

Q. I like using gel stain on difficult to stain woods like birch because it doesn't leave a blotchy look. But man, the stuff is a pain to get out of corners. No matter how hard I push, I can't force the rag deep enough into the corner to clean up the excess stain. Got any neat tricks?

Bruce Pinski
Ontario, CA

A. It's no picnic to get any kind of stain out of a corner, and the thick consistency of gel stain makes it especially tough. Here's our suggestion: Use a dry brush to whisk away the excess gel stain. Unlike a rag, the bristles of the brush are easy to get into corners. Use a rag to wipe excess stain off the brush and to keep it dry. It works great! Be sure to clean the brush after you're done so it's ready to come to the rescue the next time you stain yourself into a corner.



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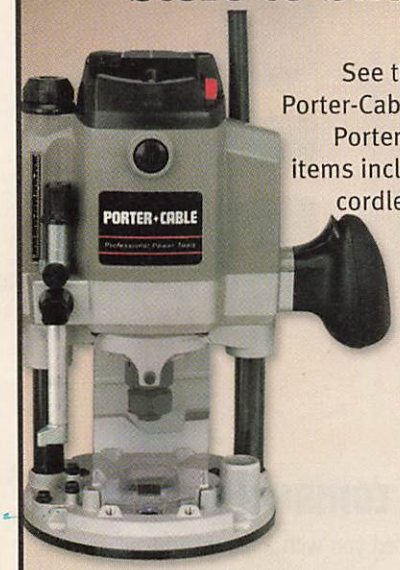

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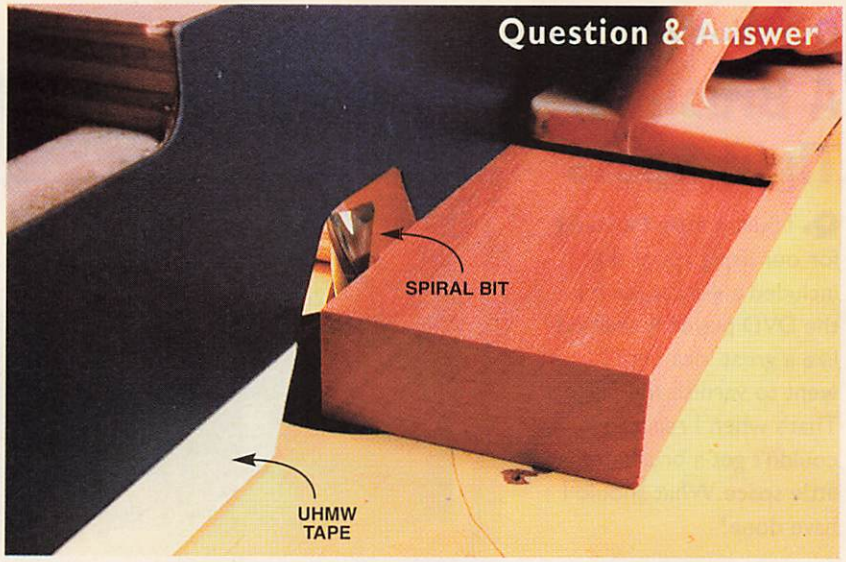
Better Joints

Q. I like the clean look of thin, solid-wood edge banding on plywood. But, without a jointer to remove the saw marks, I'm unable to get an invisible joint. Any suggestions for a guy without a jointer?

Damian Boyle
High Prairie, Alberta



A. Instead of a jointer, you can use a router table. An up-cut spiral bit does the best job, but a straight cutter will do.

For the board to have continuous support before and after the cut, you'll need to create an offset on the outfeed side of the fence that's equal to the amount of wood removed. A strip of self-stick ultra-high molecular weight (UHMW) tape on an auxiliary fence does the trick. UHMW is a special plastic that wears forever and provides a slick surface for the wood to glide on. Using a straightedge, set the fence so the cutter is exactly flush with the taped side.

To make the narrow strips for your invisible joint, start with a wide board and clean up one edge on the router table. Then rip the 1/4-in. strip from the clean edge of the board. Repeat for as many strips as you need.

See also, "Router Table Jointer Fence," AW #85, February 2001, page 38.

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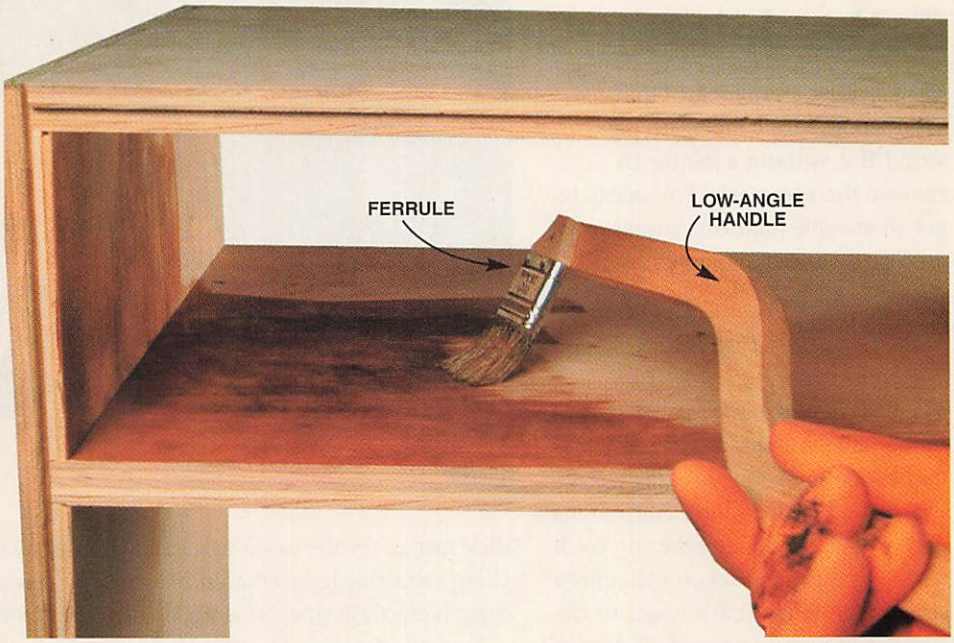
Question & Answer

A Brush for Tight Spots



Q. I built a little TV stand for our living room that included a 4-in. space for the DVD player. It seemed like a great idea until I went to varnish the piece. That's when I realized I couldn't get a brush in that little space. What should I have done?

Chu Dang
Sacramento, CA

A. Well, this may sound crazy, but when the handle of my brush gets in the way, I get the handle out of the way. That's right—cut the darn thing off!

Pick a brush you don't mind sacrificing, and cut the handle off just above the metal ferrule. Screw on a new handle made from scrap wood at a 90-degree angle. A slight S-curve on the handle keeps a low profile on the brush so it can easily fit into the tightest space.

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Oops!

One Step at a Time

Q. ARGH! I cut all the parts according to the cutting list and my face-frame came up short! I worked out the math and the cutting list was correct. What went wrong?

Shannon Hooge
St. Paul, MN

A. Rule number one when building complex projects directly from a set of plans: Don't cut every part at once! If you cut and fit as you go, your project is bound to work out. Also, if there is an error in a plan, you'll likely spot it before it's too late.

The problem with completely trusting a cutting list has to do with the fact that one small discrepancy affects the dimensions of subsequent parts. Maybe the fence on your tablesaw was off by a hair and your shelves were a bit long or maybe your 1/4-in.-deep dadoes were a little shallow. These small differences can add up to a carcass that's too wide for the face frame dimension that's specified in the plan. The solution is to build complex projects as a series of components and to cut and fit the rest of the project to what's already been built. In your case, cutting and dry fitting the plywood box first, then measuring to see what size the face frame really needed to be would've saved you time, material and aggravation.

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Question & Answer

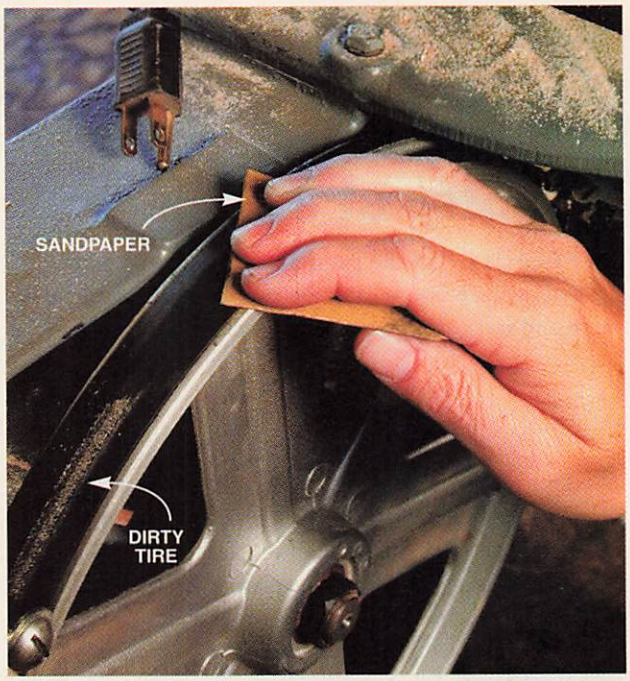
Clean Bandsaw Tires

Q. My bandsaw tires have a buildup of pitch and sawdust that seems to be embedded right into the rubber. What's the best way to clean my tires?

George Satter
Lakewood, CO

A. An excessive buildup of sawdust and pitch on your tires can lead to tracking problems, so it's a good idea to clean them periodically.

Start by unplugging your machine. Then remove the blade and tilt the table out of the way. You'll find the buildup to be much worse on your lower tire where sawdust tends to get trapped under the blade as it travels around the wheel. Use some 120-grit sandpaper or synthetic steel wool and a light touch to clean the wheel as you turn it by hand. AW



CLARIFICATION: In the Cutting List on page 59 of our Wooden Storm Door story, AW #88, August 2001, the dimensions for the grid (parts E through K) are ambiguous. The grid is 1-1/16-in. thick. Viewed from the front, as in Detail 1, all the parts are 3/4-in. wide. We regret any inconvenience this may have caused.

Ask Us

If you have a question you'd like answered, send it to us at: **Question & Answer, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121.** Sorry, but the volume of mail prevents us from answering each question individually.

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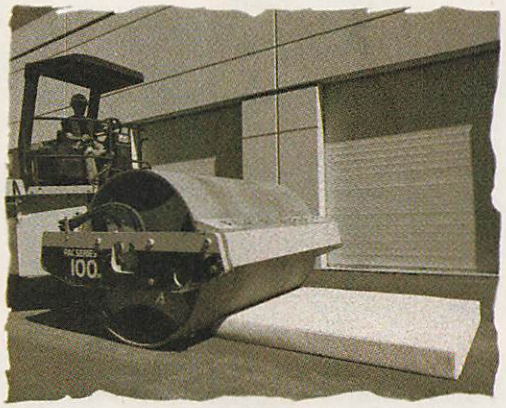

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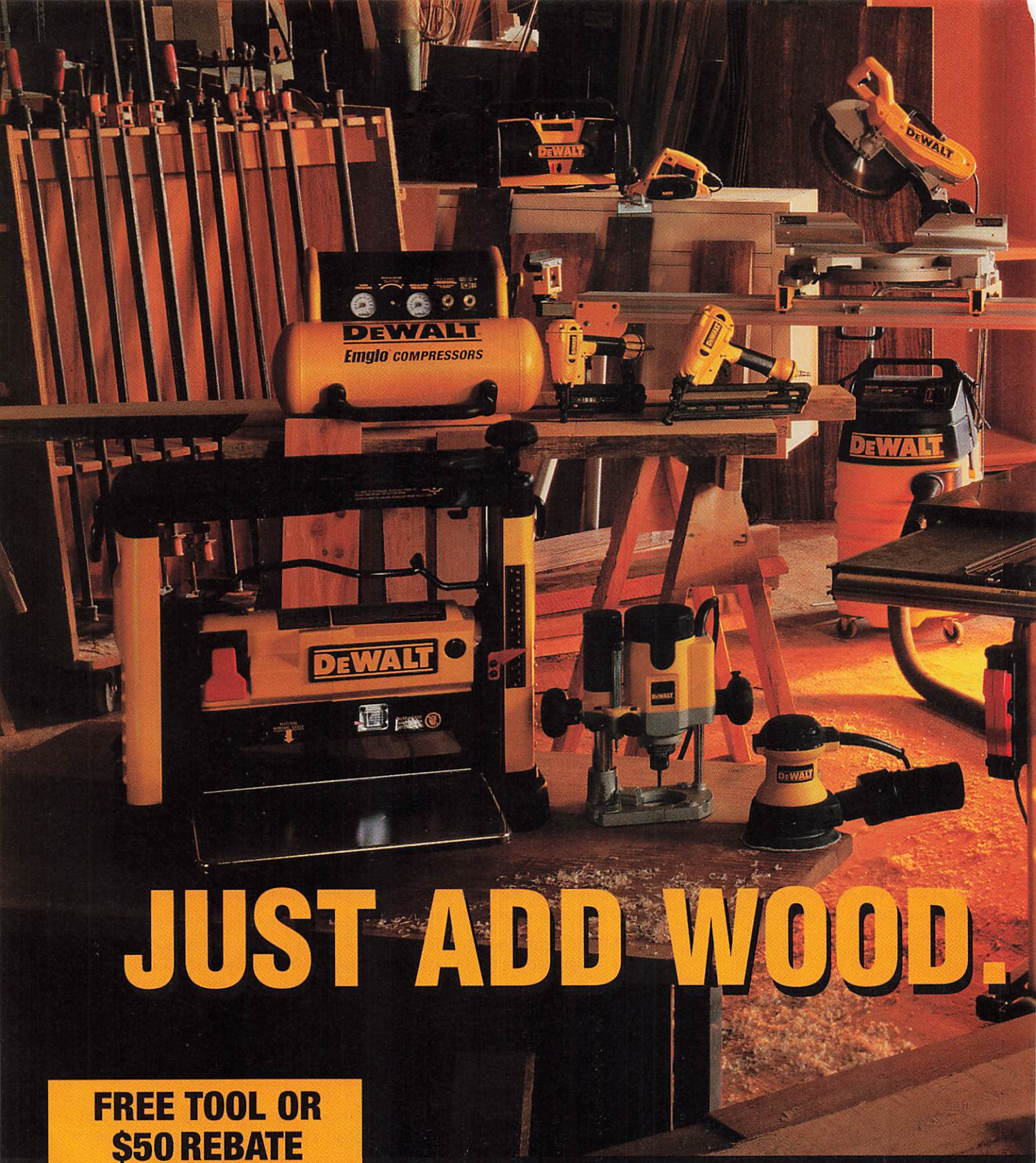

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WorkShop Tips

Splinter-Free Jigsawing

Last winter I jigsawed a whole bunch of toy parts from a sheet of plywood. I love my jigsaw, but it never fails—that darn plywood splinters every time. Finer saw blades helped, but it took way too long to cut the parts. Plywood is so expensive, I had to find a better way to cut it.

My solution? A zero-clearance base plate made from 1/8-in. hardboard. I cut a V-notch with a slot for the blade and I secured it to the base with double-faced tape. Now my cuts are virtually splinter free!

Duane Wheldon

No-Hassle Filter Cleaning

My air filter works great and sure makes my shop a cleaner and healthier place to work. But cleaning the pleated filter was always a problem. Blowing or shaking it out just made a big mess. I tried vacuuming it, but my vacuum wand would attach itself to the filter like a leech!

I tamed the beast by drilling some 3/4-in. holes in the sides of the wand. Now I just shake the wand around inside the filter and it clears out the dust without clinging to the filter. The number of holes you put in the wand depends on how powerful your vacuum is. Drill just enough holes so the wand doesn't stick to the filter.

Ralph Schafer

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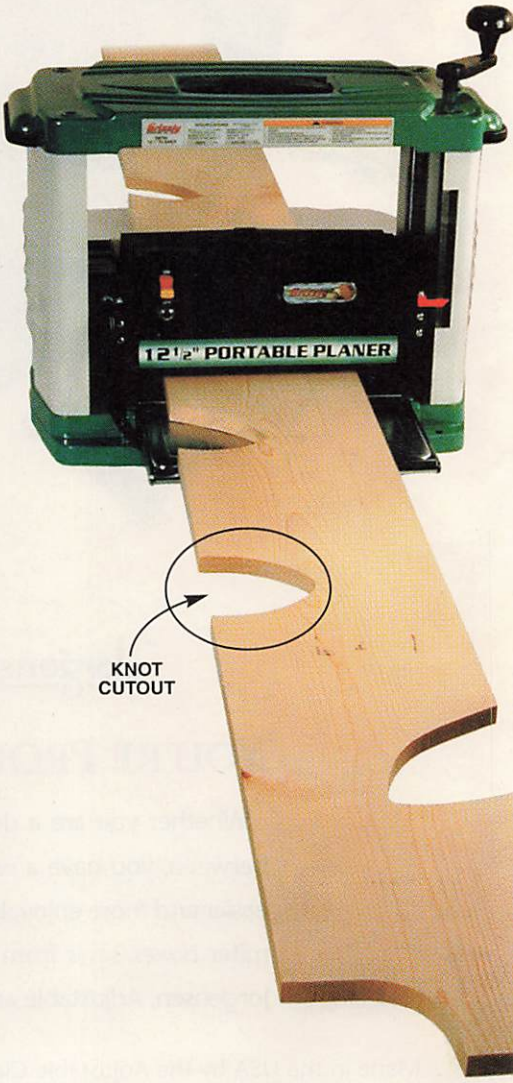
Workshop Tips

Stable Roller Stand

I bought a roller stand to support my lumber when sawing. It worked okay, but sometimes the rear leg would fold up and the stand would collapse. This was very annoying. I fixed it by adding some plastic cable ties at the top and bottom of the leg and stretching a bungee cord between them. Now my stand folds up only when I want it to.

Kim Newcomb



Knot-Free Planing

I use a lot of No. 2 pine boards, but when I plane them, the knots often nick my knives. I found a way to prevent this by cutting out the knots before I plane. Because most of my projects require only short pieces, this works fine and my knives last a lot longer.

Earl Hagen

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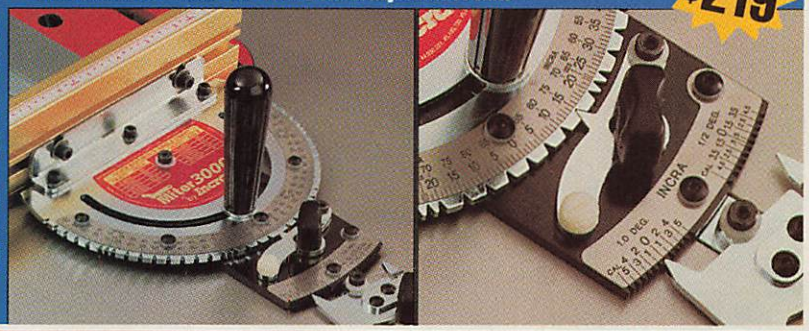

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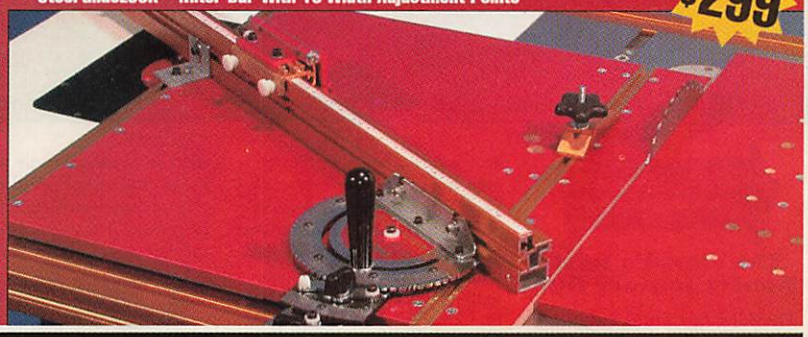

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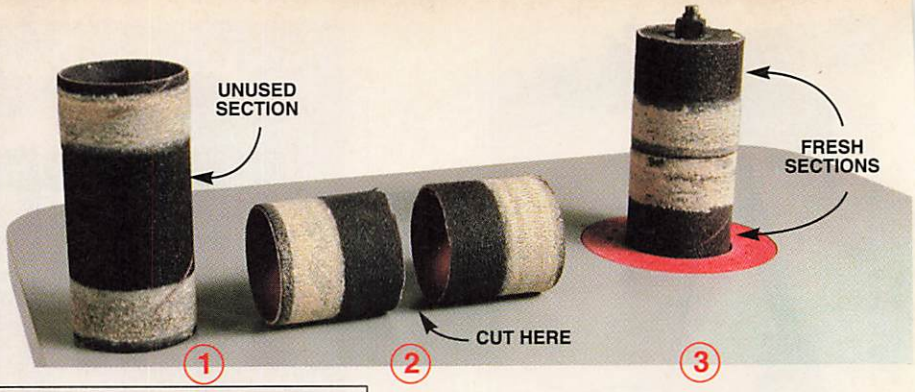
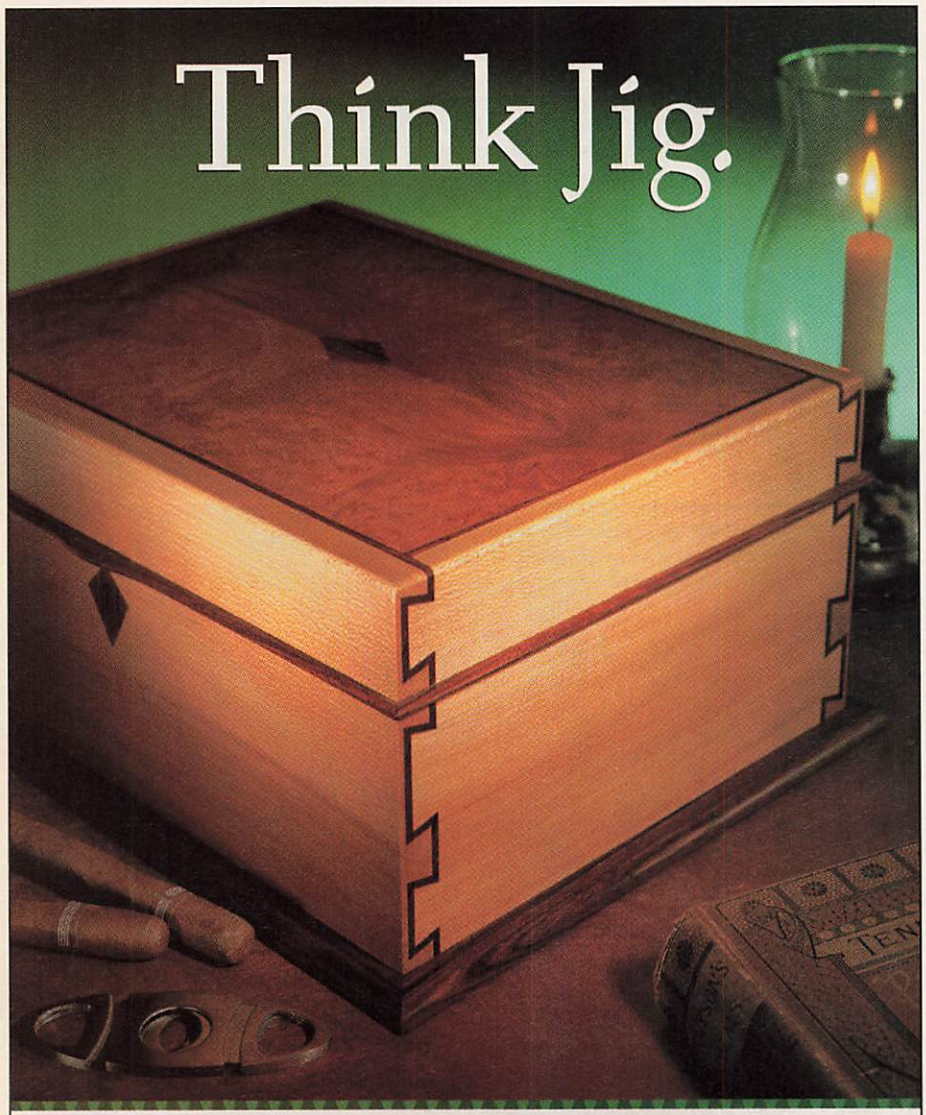
Double-Duty Sanding Drum

I sand a lot of thin wood on my drum sander and as a result, I only wear out the bottom part of the drums. Flipping them over allows me to use the top but the middle remains unused. Call me a cheapskate, but I hate throwing away anything that's still useable!

Here's my frugal solution: Cut the sanding drum in half and flip the parts end for end.

Robert Allen





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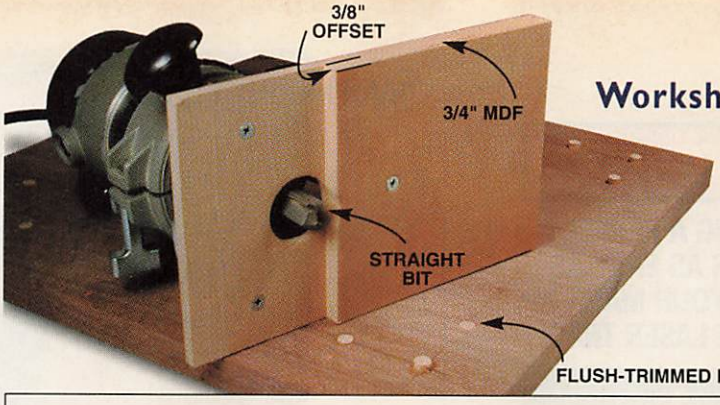
When I told my wife I was going to build her new kitchen cabinets she was delighted. I really surprised her when I dressed up the drawers with a little carving. It wasn't that hard either and I only used one carving tool; a V-gouge. It sure jazzes up the kitchen!

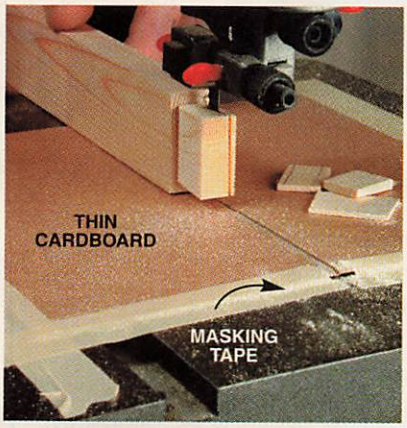
Ronald Freizburg

Plug-Trimming Router Base

I recently used wood dowels to plug some screw holes. Trimming them by hand was tough, so I made this handy offset router base. I used a scrap of MDF and made the offset on my router table. Then I drilled and countersunk screw holes that match the ones in my original router base. I attached the new base with long screws and adjusted the router bit so it cuts just shy of the full thickness of the new base. It trims the plugs almost perfectly flush, leaving me just a little scraping or sanding.

Walt Crenshaw





Zero-Clearance Bandsaw Table

I like to cut tenons with my bandsaw, but the little cutoffs tend to fall down in the space by the blade and get in the way or bind the blade. I found a slick fix. Tape a piece of thin cardboard (from something like a manila folder or old cereal box) to the table. The trimmings stay on top of the table and are easily pushed out of the way.

Earl Hagen

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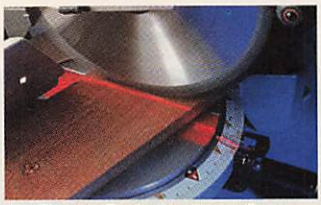

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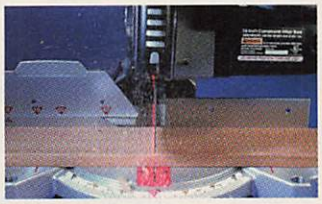

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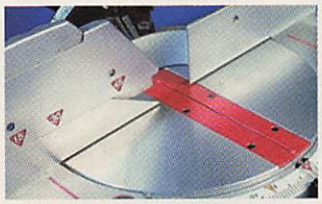

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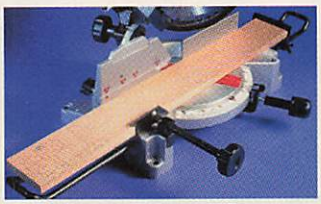

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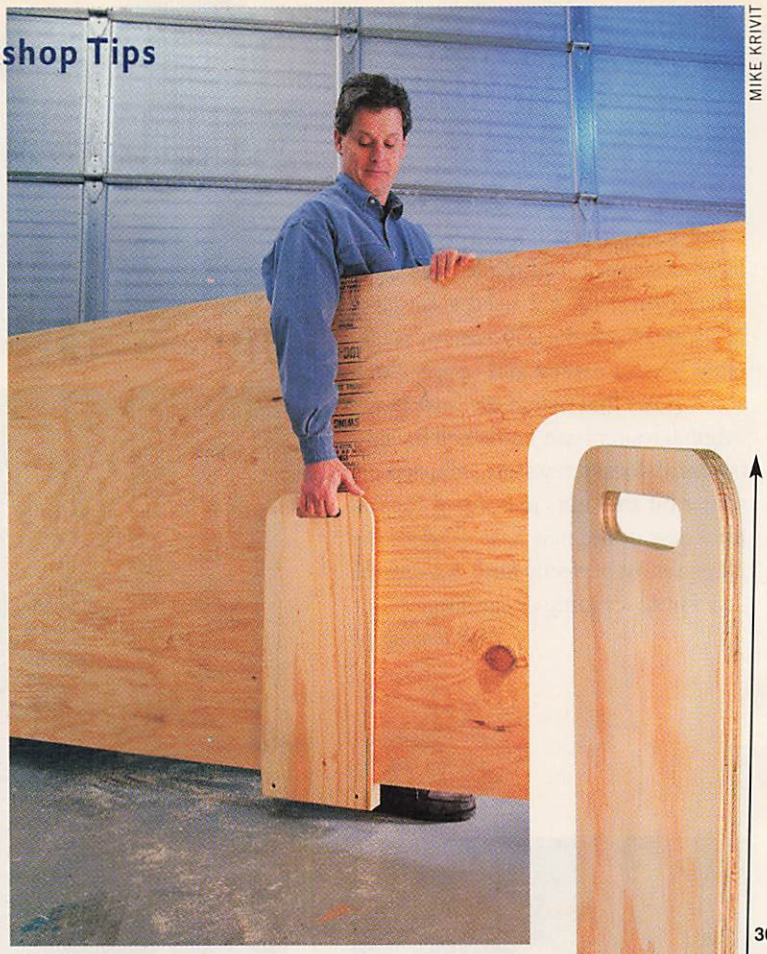
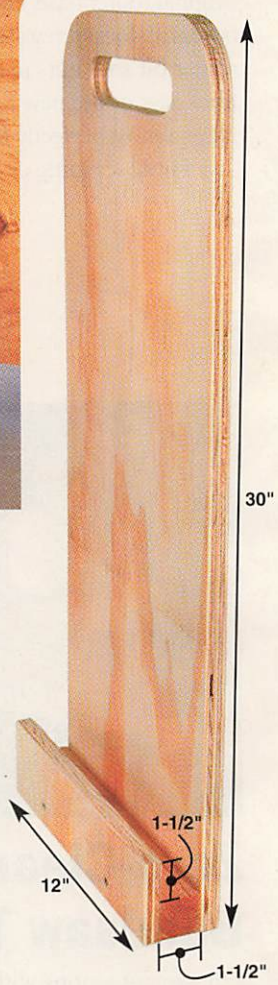


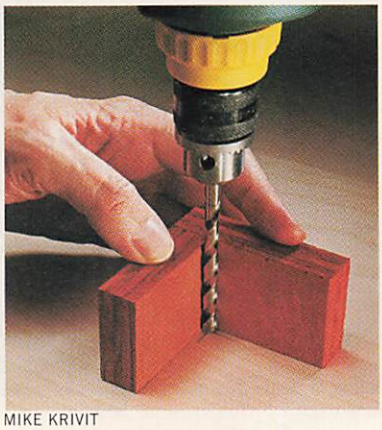
MIKE KRIVIT



Plywood Carrier

You don't have to be built like an orangutan to carry plywood! This simple carrier extends your reach and turns an awkward job into an easy one. It's quick to build out of 3/4-in. plywood, a scrap of 2x2, some glue and a few screws.

Clarence C. Kositzke



MIKE KRIVIT

Straight-Shooting Drill Jig

You may not face this problem often, but when you need to drill a hole nice and straight but the part is too big to fit on the drill press, here's what to do: Make this nifty little jig. It's about 1-1/2-in. tall by 2-in wide. Line up your drill bit in the corner of the jig and get a perfectly straight hole every time.

Nathan Skogrand

AW

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Edited by **Randy Johnson**

Small Shop Tips

MIKE KRIVIT

Classic Sawhorse

I've found a sturdy sawhorse that's great even if you have limited space. When I'm done working with them I just stack them on top of each other and store them out of the way. Here's all it takes to build one horse:

One 42-in.-long 2x6 for the top board
Four 28-in.-long 1x8 boards for the legs
Four 9-7/8-in.-long 1x8 boards for the gussets
Thirty-six 2-in. wood screws.

Notch the top board so the legs angle outward and toward the ends. Legs A and B are mirror images of each other and have compound 14-degree angle cuts at both ends. The four gussets are identical.

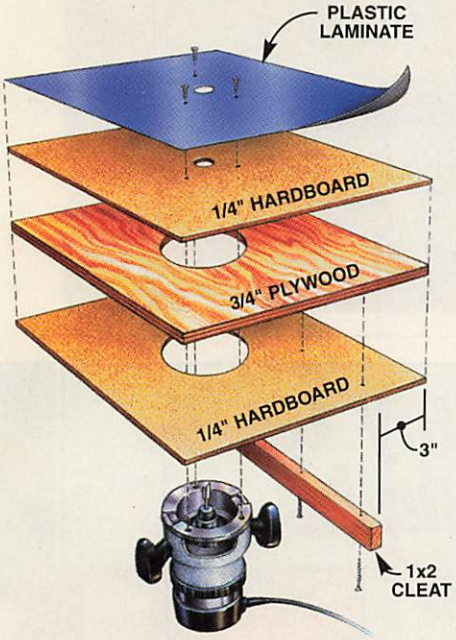
To assemble, predrill screw holes in the legs and gussets. Loosely screw the legs in the notches and screw and glue the gussets to the edges of the legs. Because the legs are not screwed tight, it's easy to line up the gussets. Tighten the screws that hold the legs to the top board and you're done.

Chris Voss

ART DIRECTION: VERN JOHNSON • ILLUSTRATION: DON MANNES

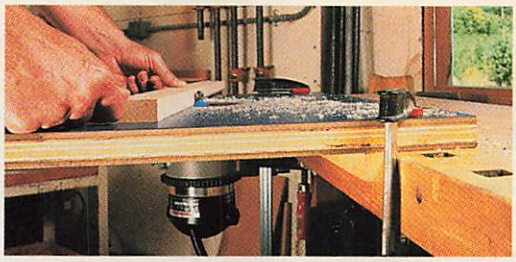
Space-Saving Router Table

I never thought I'd have room for a router table. After a couple years of messing around with different designs I came up with this compact table that sets up and knocks down in seconds and can be stored almost anywhere. You can clamp it to the edge of a workbench or across a pair of sawhorses. It's also easy to make, because instead of routing out the opening, it's simply sawn out.



Glue the bottom piece of 1/4-in. hardboard to the plywood core. Then use your router's base plate to trace the hole for the base. Cut the hole with a jigsaw and glue on the top piece of 1/4-in. hardboard. Add the plastic laminate to complete the "sandwich." Use the router base to locate the screw holes. Drill these holes and countersink them from the top. Add a 1x2 cleat to the bottom of the table about 3 in. from the back edge. The cleat helps brace the table against your bench. Finish off the top with a little paste wax.

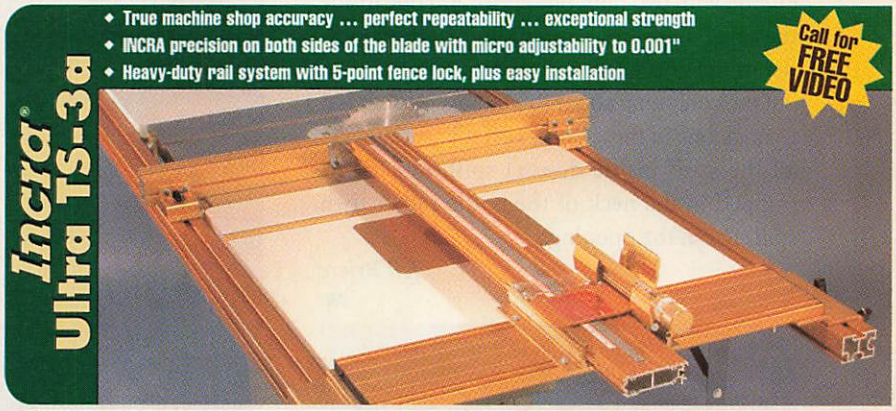
Michael Sumner

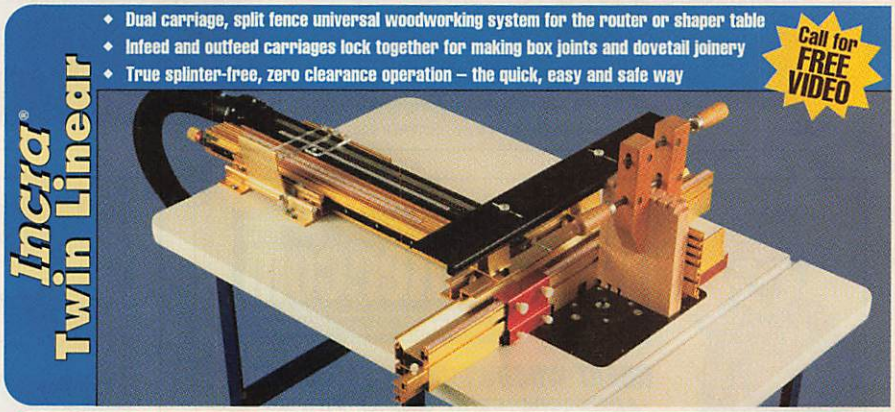


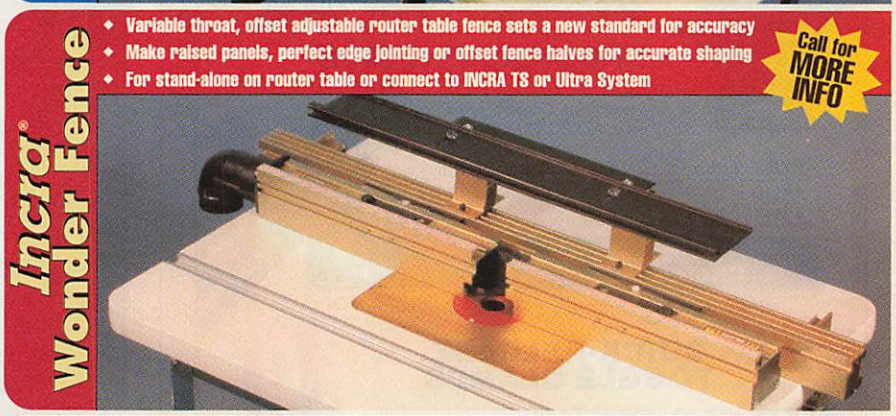
MIKE HABERMANN

Small Shop Tips

Clamp this shop-made router table to your bench and you're ready for action. The laminated construction makes it rigid and simple to build, and it can be easily stored out of the way when you're done working.







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Cheap, Easy Storage

I found a quick, cheap and easy way to store lots of little stuff like biscuits, screws, wood plugs and the like. Drill a hole in the cap of a plastic soda bottle and insert an eyebolt. Secure the eyebolt with two nuts, one above and one inside the cap. Finally, cut a round hole in the shoulder of the bottle.

One cool thing about this storage system is if I knock one of these bottles off my workbench, all the stuff inside doesn't spill out. It gets trapped in the neck of the bottle rather then spilling out the opening.

Jeff Briere
AW

If you have an original Small Shop Tip, send it to us with a sketch or photo. We pay $200 for each one we print. Send to: **Small Shop Tips, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121.** Submissions can't be returned and become our property upon acceptance and payment.

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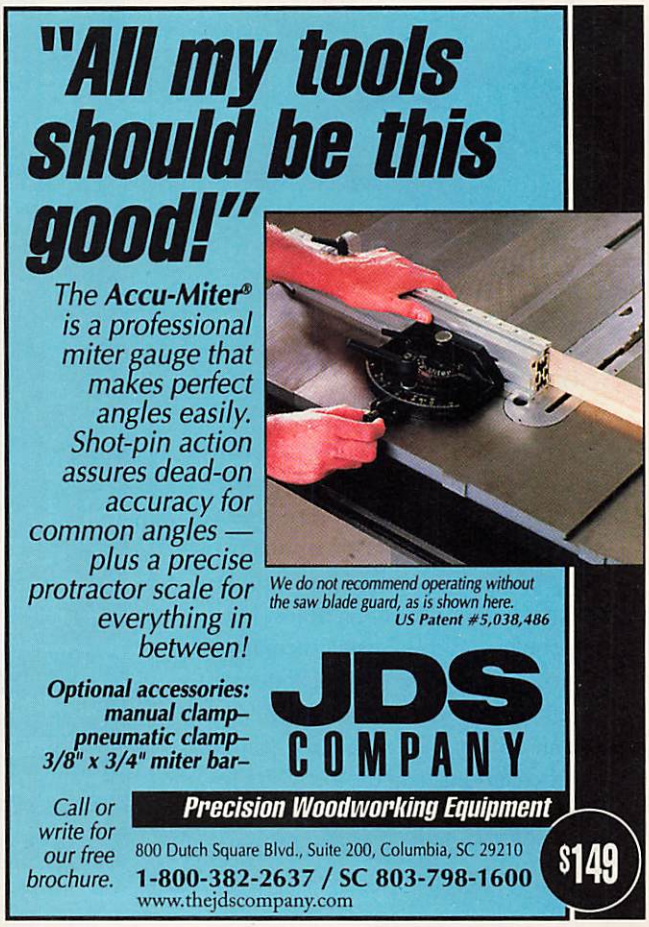
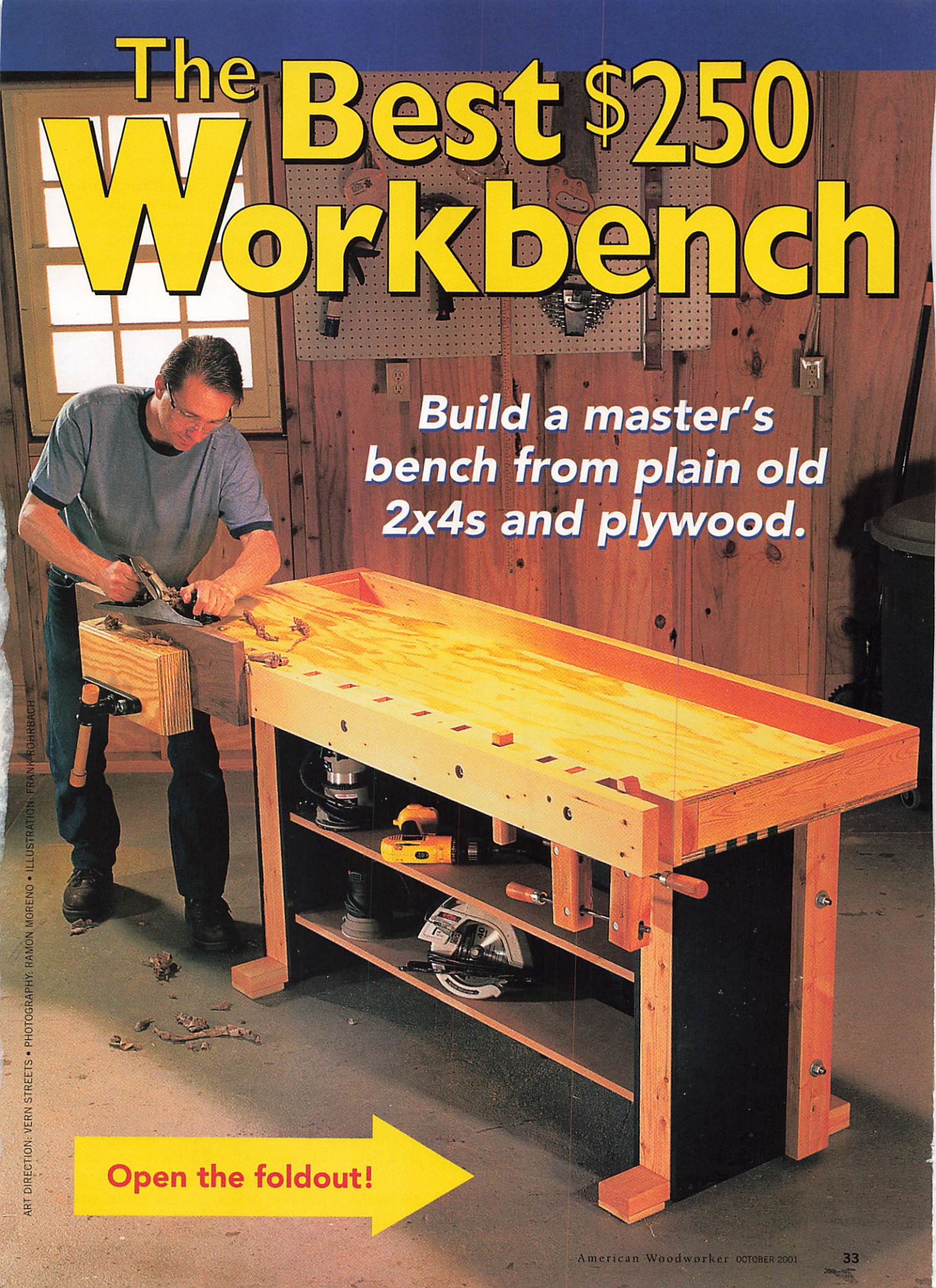


The Best $250 Workbench

Build a master's bench from plain old 2x4s and plywood.



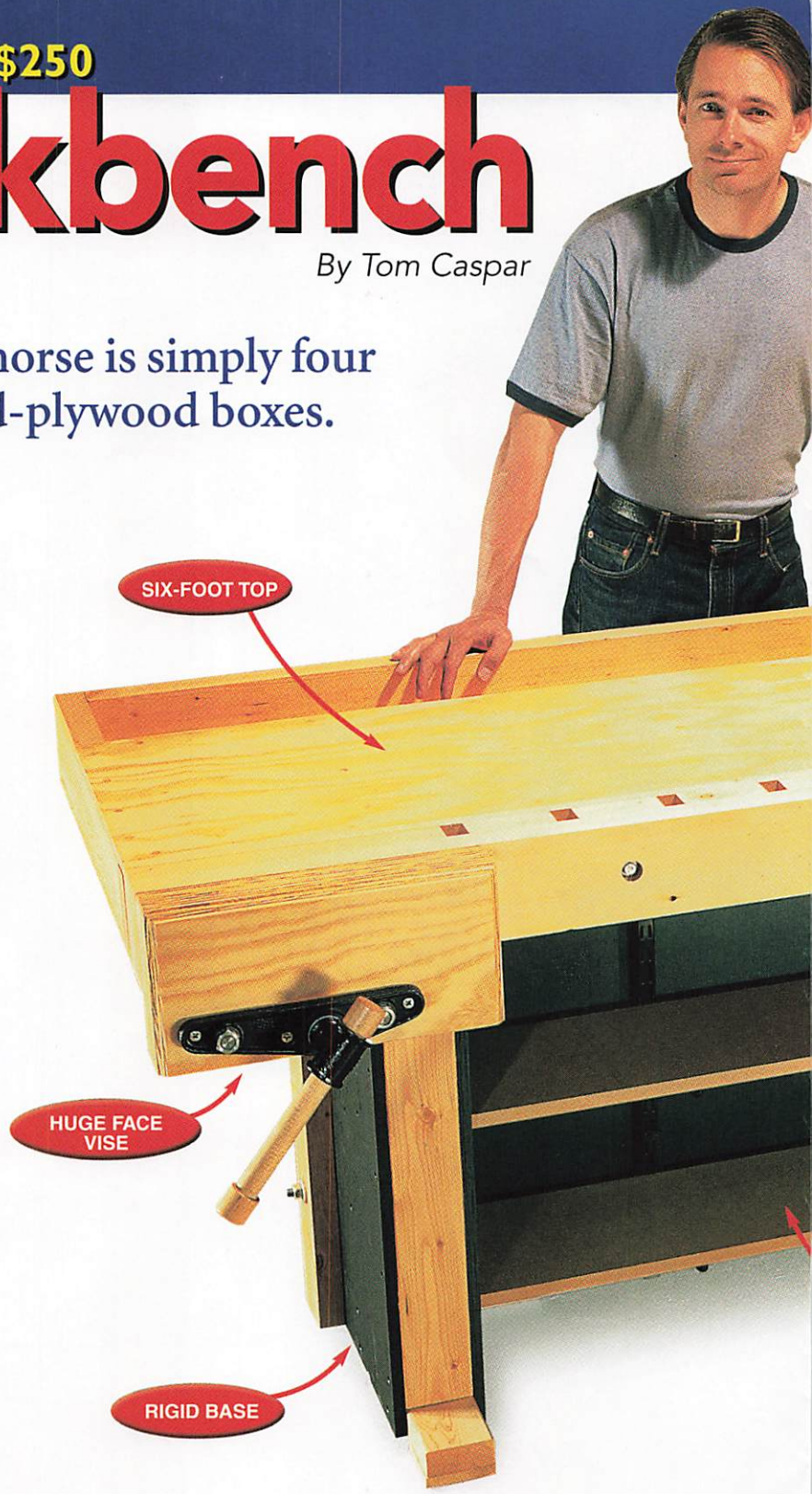
ART DIRECTION: VERN STREETS • PHOTOGRAPHY: RAMON MORENO • ILLUSTRATION: FRANK ROHRBACH

Open the foldout!

The Best $250 Workbench

By Tom Caspar

This rock-solid workhorse is simply four easy-to-build 2x4-and-plywood boxes.



Quick, cheap, solid. You can't ask much more from a workbench, and this one delivers it all. Made of out nothing more than ordinary construction lumber, this durable, 250-lb. heavyweight has all the features of a master cabinetmaker's bench: a gigantic face vise, a slick tail vise and a rock-solid base.

You'll spend a measly $150 at a home center on lumber and hardware. Add $70 to $150 for a face vise (see Sources, page 43). We used a cool-looking, top-notch model, but any big vise will do.

Tools and Materials

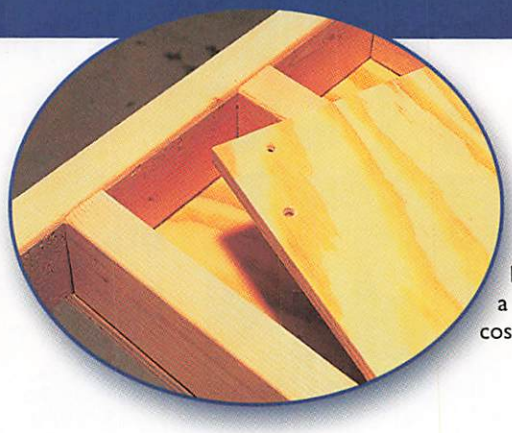
If you have limited tools, don't worry. It's perfectly possible to build this bench using nothing but a pair of sawhorses, a circular saw, hammer, drill, combination drill bit, router and flush-trim bit, hacksaw and socket set. That's it. A few more power tools (a miter saw, drill press, tablesaw and belt sander) make the job a lot easier, though.

The materials are nothing special, just 2x4s, 2x6s and two sheets of ordinary underlayment plywood (the kind with 1/8-in.-thick face veneer). Be picky when choosing your solid lumber. Look for boards that are straight, free of large knots and have full-width edges. Reserve your straightest boards for the top frame.

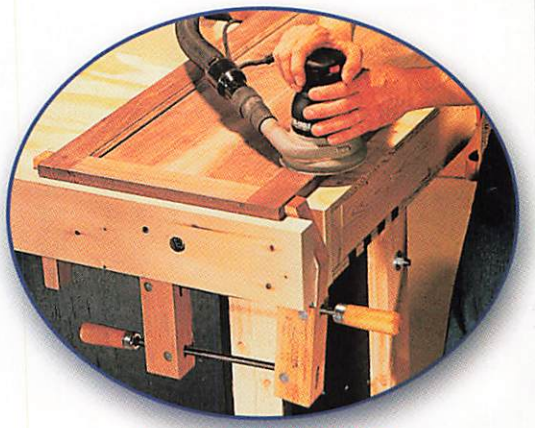
Preparing the Plywood

Start by cutting out the plywood panels. Factory edges are good enough, so you don't have many cuts to make. The few corners that have to be absolutely square are already done!

1. Draw the outlines of all the plywood panels (A1, B1, C1 and C2) on two sheets of plywood (see Fig. C, page 41 and the Cutting List, page 43).
2. Build a temporary cutting guide to fit your circular saw (Photo 1). It's easy to make by nailing together two overlapping 1x6s cut just over 6 ft. long (you'll use these boards later as parts of the bench). The edge of the bottom board shows you exactly where the saw will cut, so you don't have to do any complicated measuring. The top board guides the saw. Nail some extra pieces of 1x6 under the overhang of the top board for balance.



Thrifty Construction
Rugged boxes made of nothing but 2x4s and plywood add up to a high-performance bench that costs peanuts to build.



Ingenious Tail Vise
Hold any project with no awkward clamps to get in the way.

You Don't Have to Be an Expert
Got a hammer, drill and circular saw? That's virtually all it takes to build this awesome workbench.

3. Place the cutting guide directly on the lines and cut all the panels.
4. Mark the screw holes (see Fig. D, page 41) on one side of an end panel (A1) and a center-section panel (B1).
5. Stack all four end panels on top of each other and drill 5/32-in.-diameter pilot holes all the way through them (Photo 2). Gang up the center-section panels and drill through them, too.
6. Countersink *both* sides of all the screw holes. (The countersink on the back side removes torn fibers, so you get a tight glue joint.)
7. Paint one side and all four edges of the panels black. This covers up the crazy figure and disguises the screws. A roller works great.

Building the End 2x4 Frame

The method for building each section is basically the same; you glue and screw plywood panels to a 2x4 frame. Once you get in gear, you'll bang out your

text continued on page 40

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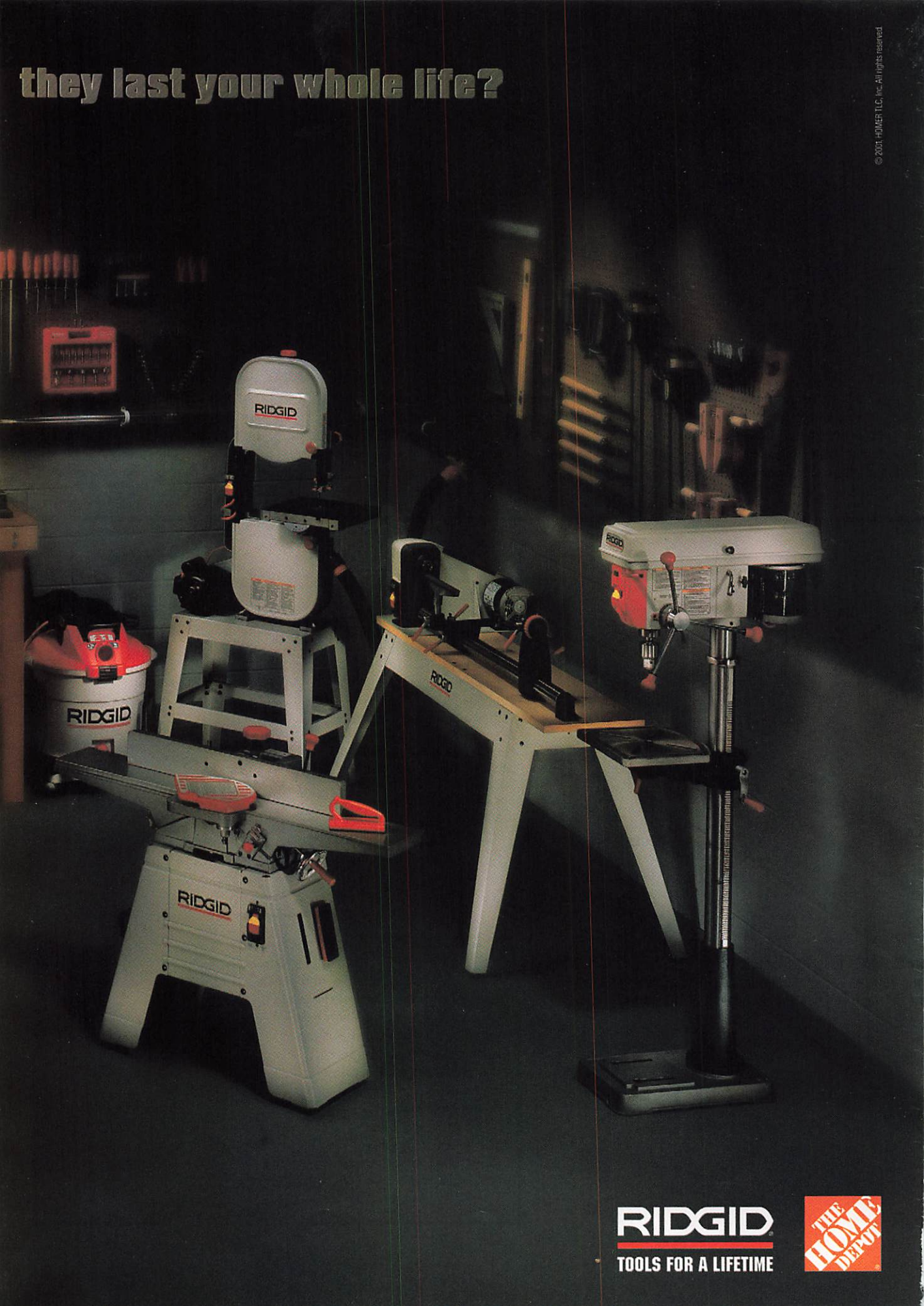

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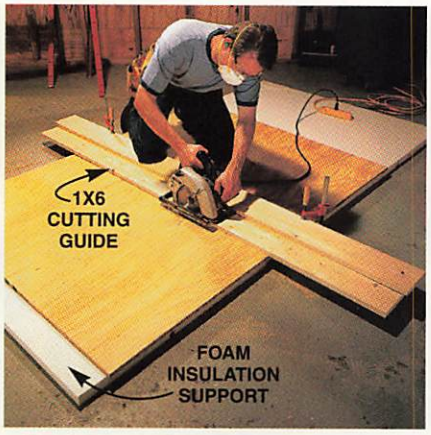
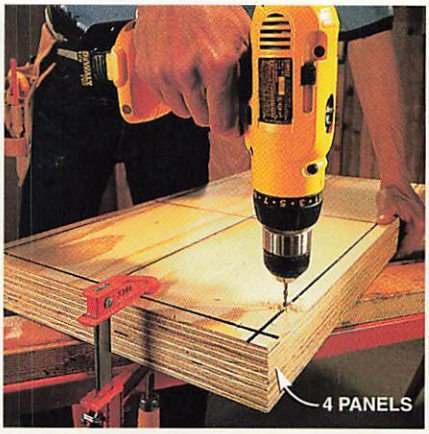


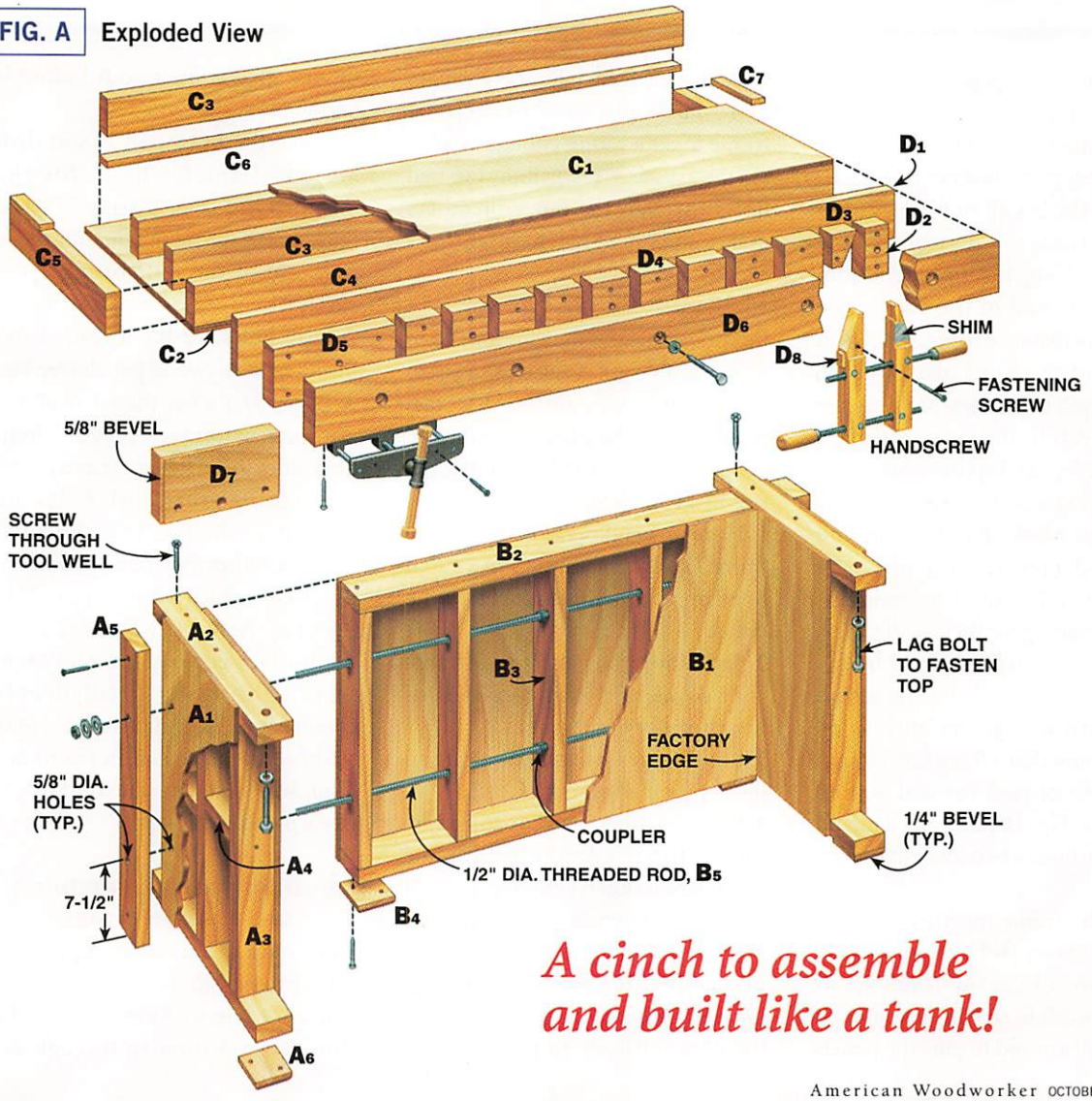
1 Cut panels from construction-grade plywood with a quickie shop-made cutting guide. Even if you're off by a bit, these cuts are going to be accurate enough to build the bench.



2 Drill pilot holes through a stack of four panels at once. This is much faster than laying out and drilling one panel at a time.

3 Measure the lengths of 2x4s directly from the plywood panels. The 2x4s should be fairly straight, but you don't have to machine them any further. All you do is crosscut.

FIG. A Exploded View



A cinch to assemble and built like a tank!

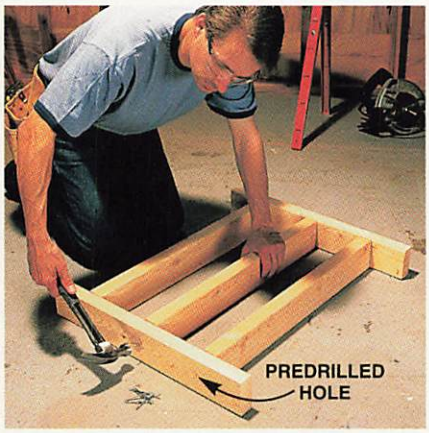
Detail 1

Spacing of Blo

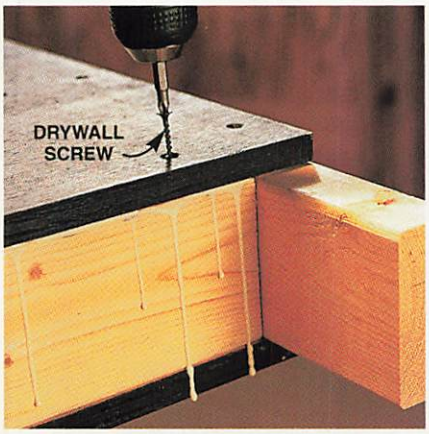
Detail 2

Tight Connecti

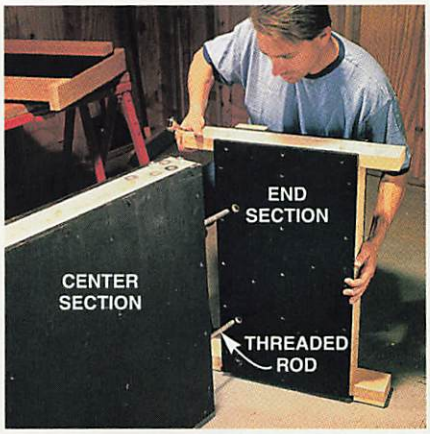
The 2x4 frame of
guarantee a tight



4 **Nail the 2x4s together** with a single nail at each joint. The joints don't have to be super tight or perfectly fitted. The strength of the box doesn't depend on complicated joinery.



5 **Screw and glue plywood panels** to the 2x4 frame. You won't need dozens of clamps because the screws do all the work. Painting the plywood black disguises all the ugly screw heads.



6 **Join the knockdown base** with humongous threaded rod. Nuts pull the sections so tight that the base is solid as the Rock of Gibraltar. After all, a workbench base can't be too strong, can it?

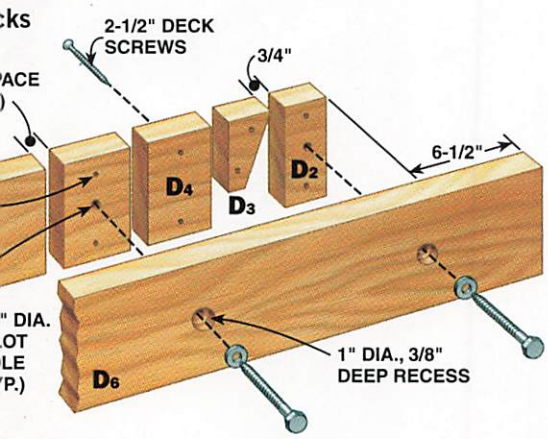
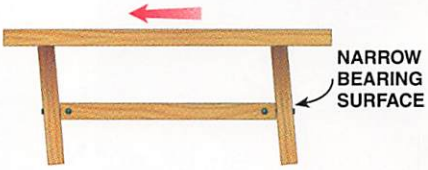


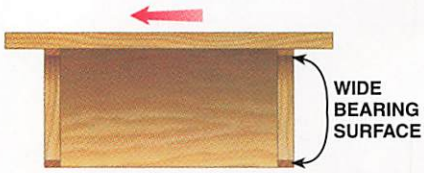
FIG. B

A Rock-Solid Foundation

A workbench that shimmies and shakes is a giant headache, especially when you use hand tools. It's supposed to stay still! The solution is having a heavy base that won't budge or twist out of shape when you push against it. Our hefty base weighs 125 lbs. and doesn't give an inch in any direction.



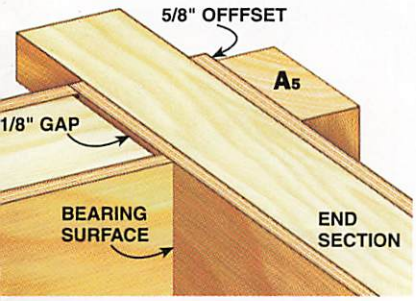
A solid-wood base can distort under pressure.



A plywood base isn't going anywhere.

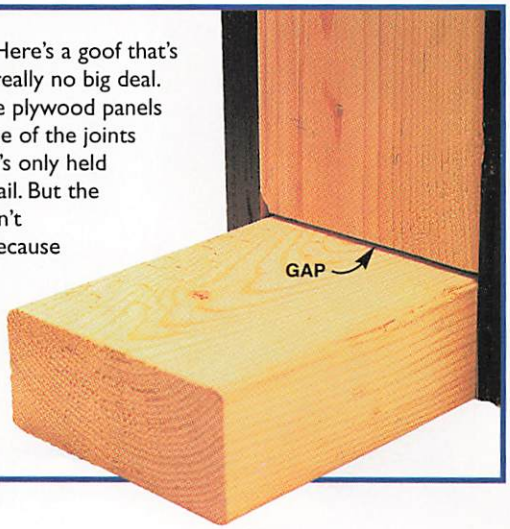
on Between Base Sections

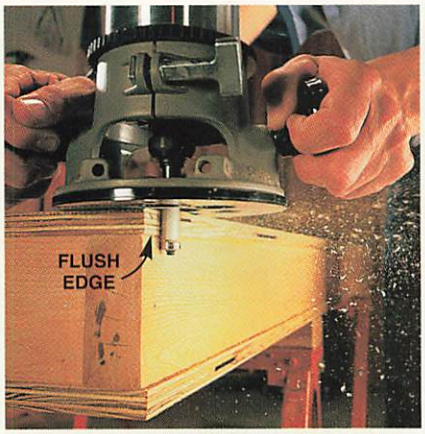
the center section is slightly undersized to fit between the bearing surfaces and the end section.



Oops!

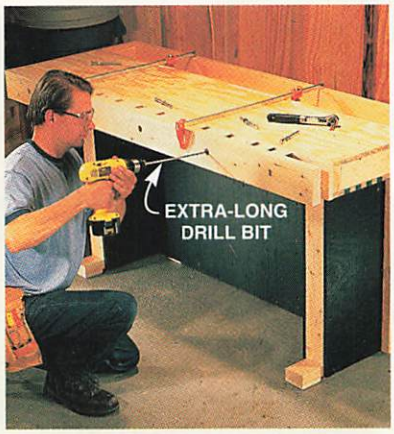
Here's a goof that's really no big deal. In the rush to glue the plywood panels on the 2x4 frames, one of the joints opened up. After all, it's only held together by a single nail. But the strength of the box isn't compromised at all, because its incredible rigidity comes from gluing plywood to the 2x4s, not the tightness of these joints. No sweat.





7 **Rout the plywood top** flush with the frame to make a large, even surface for the 1x6 rail. Select your best 2x4 for this front piece. It's one of the few in the bench that must be perfectly straight. It pays to dig through a large stack of 2x4s to find this gem.

8 **Assemble the front rail** one block at a time. Two outer blocks trap one angled jaw of a wooden handscrew: the bench's tail vise. Each succeeding block is spaced 1-in. apart, exactly the width of a combination square blade. These spaces become mortises for the bench dog.



9 **Clamp the front rail** to the benchtop and drill pilot holes for the lag bolts. The bolt heads are recessed so you have a completely smooth bench front.

text continued from page 36

bench in no time at all.

1. Cut the top and bottom 2x4s (A2). Measure the length of the legs (A3) directly from the plywood panel (Photo 3). Gang the top and bottom 2x4s at one end of the panel. The remaining distance from the 2x4s to the end of the panel gives you the exact length of the legs. Measure the spacers (A4) by the same method.
2. Cut the legs and spacers. Select the best looking wood for the face of the front legs. Mark "Front" clearly on the good face so you won't be confused in the heat of assembly!
3. Select one leg for the middle. With a combination square set to 3/4 in., draw a centerline down the length of its narrow edge, on both sides. Draw a centerline all the way around the middle of each top and bottom piece (see Fig. D, page 41). Line up the centerlines when assembling the frame.
4. Nail the frame together on a flat surface (Photo 4). The floor will do. Make sure all the top edges are as flush as possible, so you have an even surface all around to glue the panels on. One nail at each joint is enough. (The nails only serve to keep the frame together long enough to glue on the panels.) Predrilling the nail holes through the outer members makes alignment much easier.

Assembling the Ends

It's time to get out the glue and go to town. You've got a lot of screws to drive, but there's no need to feel rushed. Once the panel is positioned the glue will stay wet long enough to run in all the screws.

1. Place one end panel on top of the frame. Nudge the frame square so it lines up with all four edges of the panel.
2. Tack down the panel to the frame with 4d nails at each corner. Turn the assembly over.
3. Run a large bead of glue along all the exposed edges of the 2x4s.
4. Place the other panel on top of the frame, align its edges with the frame and screw it down (Photo 5).
5. Turn the assembly over again, pry off the tacked-down piece of plywood with a hammer and pull out the nails. Then glue and screw the plywood back in place. Scrape off the glue squeeze-out before it hardens.
6. Make the braces (A5) and drill 5/8-in.-diameter holes for the threaded rod (Fig. A, page 37). The thick braces spread out the enormous pressure of the nuts over a large surface.
7. Drill holes for the threaded rod through the plywood panels (see Fig. A, page 38). Rather than drill all the way through from one side, drill from both sides using the brace as a guide. This ensures that both holes are aligned so the rod will slip right through. Offset the brace 5/8 in. from the panel's edge (Detail 2, page 37).
8. Cut all the feet (A6 and B4). Bevel the bottom edges to protect them from splintering. Drill deeply countersunk pilot holes for the screws so the screw heads can't scratch your floor. Screw two feet onto the bottom of each end section.

Building and Assembling the Center Frame

This frame has two important differences from the end frames you just made. First, it's got holes for the threaded rod running through the

2x4s that you can't afford to forget! Second, the frame is slightly shorter than the panels. When you assemble the whole base, any warp or twist in the center frame's end 2x4s won't affect the tightness of the joints (see Detail 2, page 37).

1. Cut the rails (B2) 1/4 in. shorter than the width of the plywood panels. Then cut the stiles (B3).

2. Drill 1-in.-diameter holes in all the stiles. The holes are oversized to allow a threaded rod coupler to pass through (Fig. D, below right).

3. Nail the frame together, then tack a panel to it. Check your alignment. The frame's top and bottom edges are flush to the panel, but the ends of the frame are inset by 1/8 in. on both sides. Glue both panels, one at a time, as you did with the end sections. Attach the feet.

Assembling the Base

Two lengths of threaded rod (B5) bind the three base sections together with tremendous pressure. This large-diameter rod is surprisingly inexpensive, easy to disassemble and can't possibly come loose.

1. Cut the threaded rod with a hacksaw (see Cutting List, page 43). File a small bevel on the cut ends to enable the nuts to thread easier. Join two pieces of threaded rod together with a coupler and slide the long rod through the holes in the center section.

2. Stand the center section on a level surface. Slip the end sections over the threaded rod and slide on two washers (Photo 6). Tighten the nuts.

Assembling the Top

Select your straightest 2x4s for this frame so you'll get a relatively flat top. Put the best of the best in the front.

1. Predrill the pilot holes in the top and bottom panels (C1 and C2). Note that the holes in the upper surface of the top aren't simply countersunk, but counterbored deep enough to accept wood plugs (the plugs cover all the unsightly screw heads). The easiest way

FIG. C

Plywood Cutting Diagram

Using factory edges for many of the plywood parts means fewer cuts and guaranteed square corners. All you need to cut out the parts is a portable circular saw and a shop-made cutting guide.

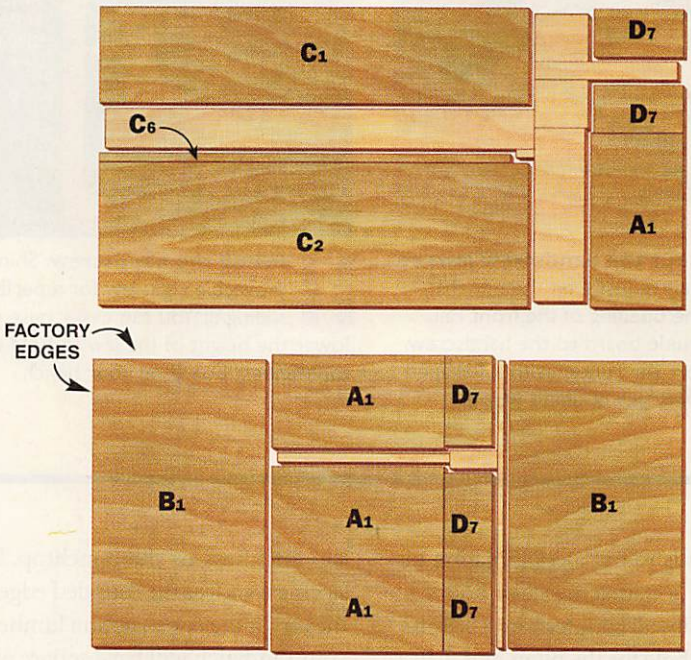
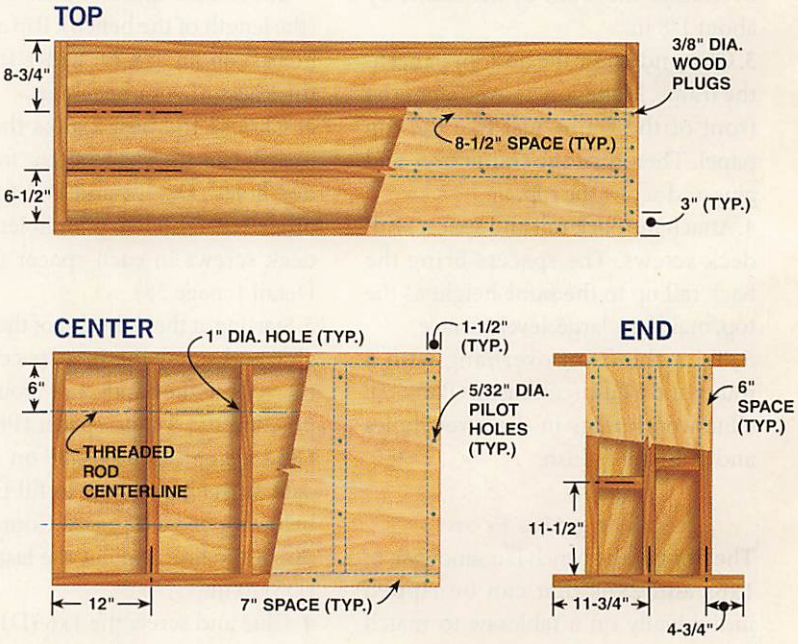
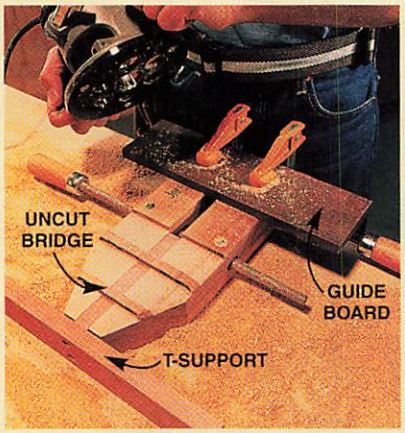


FIG. D

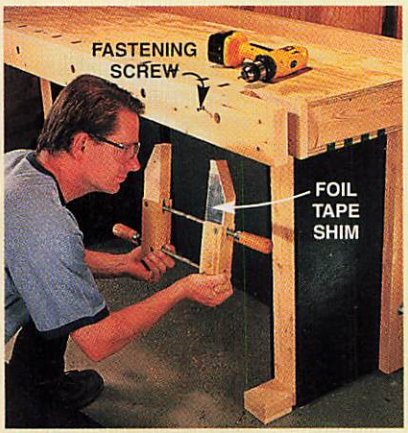
Construction Details

The plywood panels are glued and fastened to 2x4 frames with drywall screws. Predrill the screw holes as shown below, nail the frame together with a single nail at each joint, and you're set.

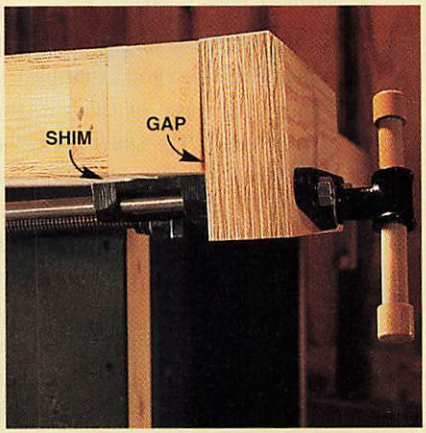




10 **Rout the handscrew jaws** so they're just a bit thinner than the opening of the front rail. Clamp a guide board to the handscrew and support the router with a T-shaped ledge and bridges of uncut wood.



11 **Install the handscrew.** Shim its moveable right jaw for a perfect sliding fit. You can easily raise or lower the height of the jaw to hold even the thinnest board on your bench.



12 **Tilt the front vise** by adding washers as shims to compensate for racking. To securely hold any board, a vise should first close at the top. As you tighten the screw, the face of the vise straightens out, applying even pressure over the entire surface of the board.

to do this is to use a combination bit made for a #10 screw (see Sources, page 43). It will counterbore a 3/8-in.-diameter hole for the plugs and drill a pilot hole at the same time.

2. Nail the frame together, but leave off the back stretcher (C3) and all of the spacers (C6 and C7). Tack the top (C1) to the frame with 4d nails at each corner. Note that the front of the top overhangs the front of the frame by about 1/8 in.

3. Glue and screw the bottom panel to the frame. Make sure it overhangs the front of the frame just like the top panel. Then turn the frame over and glue and screw the top.

4. Attach the back rail and spacer with deck screws. The spacers bring the back rail up to the same height as the top, making a large, level surface.

5. Trim the front overhang with a router and a flush-cutting bit (Photo 7). Glue wood plugs in the screw holes and sand them flush.

Building the Front

The front of the bench is a sandwich of 1x6s and 2x6s that can be ripped individually on a tablesaw to match the thickness of the benchtop. This sawing removes the rounded edges on the top of the construction lumber, so your sandwich will have square edges on top and look like one gigantic solid piece when glued together. If you can't get at a tablesaw, this isn't absolutely necessary, but a flush front makes mounting the vise hardware much easier.

1. Cut one 1x6 and two 2x6s 6-ft. long (the length of the bench). Rip all three boards about 1/8-in. wider than the thickness of your benchtop.

2. Choose the best 2x6 as the outer board. Cut the spacers that form the dog holes (D2, D3 and D4) from the other 2x6. Drill two pilot holes for the deck screws in each spacer (Fig. A, Detail 1, page 38).

3. Starting at the right end of the bench, glue and screw the first spacer (D2), then clamp the handscrew around it to position the second spacer (Photo 8). Glue a small block (D8) on the left side of the handscrew to fill the void below the second spacer. Continue on down the line and cut the last spacer (D5) to fit.

4. Glue and screw the 1x6 (D1) along the top of all the spacers, completing the three-part sandwich. Drill pilot holes for the lag screws with an extra-long bit (see Sources, page 43) and install the front rail on the bench (Photo 9). Clamp it in place so the top edge is proud of the benchtop. Level the front rail with a belt sander.

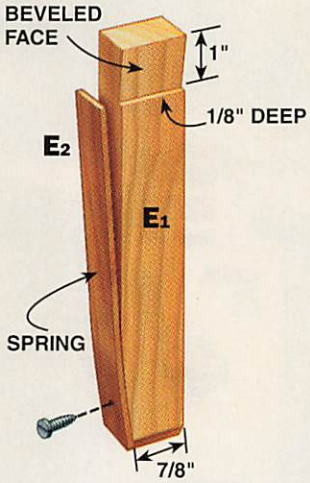
5. The jaws of the handscrew are too fat to fit in between the boards of the front rail. Use your router to make the jaws thinner, working from both sides (Photo 10). The final thickness of the jaws should be about 1/32 in. narrower than the opening in the front rail. The area you must remove is larger than the base of the router, so don't take it all off at once. Leave some areas uncut to support the router, then knock these bridges off with a chisel after you're done. Finish leveling the jaws with a block plane. Bevel the end of the right jaw with a small saw and chisel (same as the bench dog, Fig. E, page 43). This bevel improves the holding power of the handscrew, especially when the jaw is tilted backward at its maximum capacity.

6. Shim the right jaw of the handscrew with several layers of foil tape (the kind

FIG. E

Bench Dog

The dog leans slightly backward when you grip a board in the tail vise. Bevel the head to keep its gripping surface upright. The wooden spring keeps the dog at any height, freeing your hands to adjust the tail vise.



CUTTING LIST

Workbench

Overall Dimensions: 72"L x 27-1/2"W x 34-1/4"H

Part	Name	Qty.	Material	W x L
Ends				
A1	Panels	4	5/8" plywood	15-1/2 x 29
A2	Top and bottom	4	2x4	23-1/2
A3	Legs	6	2x4	26
A4	Spacers	4	2x4	5-1/2
A5	Braces	2	2x4	29
A6	Feet	4	1x6	3-1/2 x 3-1/2
Center				
B1	Panels	2	5/8" plywood	29 x 48
B2	Rails	2	2x4	47-3/4
B3	Stiles	5	2x4	26
B4	Feet	2	1x6	3-1/2 x 3-1/2
B5	Threaded rod	4	1/2" dia.	31
B6	Shelves	2	3/4" stock	11 x 48
Top				
C1	Top panel	1	5/8" plywood	16 x 72
C2	Bottom panel	1	5/8" plywood	24 x 72
C3	Stretchers	3	2x4	69
C4	Front	1	2x4	72
C5	Ends	2	2x4	22-3/8
C6	Long spacer	1	5/8" plywood	1-1/2 x 69
C7	Short spacers	2	1x6	1-1/2 x 8
Front				
D1	Inner rail	1	1x6	72
D2	Right end spacer	1	2x6	4-7/8 x 2-1/2
D3	Angled spacer	1	2x6	2-3/4 x 2-3/8
D4	Spacers	9	2x6	4-7/8 x 4
D5	Left end spacer	1	2x6	4-7/8 x 14
D6	Outer rail	1	2x6	72
D7	Vise face	5	5/8" plywood	7-1/4 x 15
D8	Filler	1	1x6	1-1/4 x 2
Dog				
E1	Body	1	2x4	1 x 1-3/8 x 8
E2	Spring	1	hardwood	1/8 x 1 x 7

Shopping List

All the materials (except for the big vise) are garden-variety stuff, available at any home center.

- 2 sheets of 5/8" fir plywood
- About 120 lineal feet of 2x4s
- 2 pieces of 1x6, 8' long
- 2 pieces of 2x6, 8' long
- 1 4x8 piece of polystyrene insulation, 1-1/2" thick, for use as a cutting platform only
- 2 lbs. #6 coarse-thread drywall screws, 1-5/8" long
- 1 lb. deck screws, 2-1/2" long
- 1 lb. 8d finishing nails
- 1 lb. 4d finishing nails
- 4 pieces of 1/2" dia. threaded rod, 3' long
- 2 couplers, 4 nuts and 8 washers for the threaded rod
- 2 lag screws, 3/8" dia., 3" long
- 5 lag screws, 3/8" dia., 6" long
- 7 washers for the lag screws
- 1 qt. flat black paint
- 50 flat head maple plugs, 3/8" dia.
- 1 gal. yellow glue
- 1 handscrew, 12" long jaws
- Foil tape

used for ventilation ducts) until it slides smoothly in the front rail opening (Photo 11). Then install the handscrew and secure it with a screw. Chances are, as the construction lumber dries out and shrinks you'll have to remove the handscrew and peel off some shims to keep it sliding well.

7. Glue the vise face together (D7) with cauls and plenty of clamps. Cut the pieces oversize and trim the glued block on a tablesaw, if you can. Turn the benchtop over and install the front vise hardware with the largest and longest screws you can manage (Photo 12). AW

A buck a pound for the best bench around!

Sources

Woodcraft Supply
(800) 225-1153, www.woodcraft.com
Economy front vise hardware, #01E23; $68
Master cabinetmaker's front vise hardware, #17D04; $110
Quick-release front vise hardware, #17A11; $140 (shown here)
Handle for all three, #17E52; $5
Set of combination bits, #128900; $17
Extra-long, 1/4-in. drill bit, #11Z01; $9.

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at every angle.
14" Closed Stand
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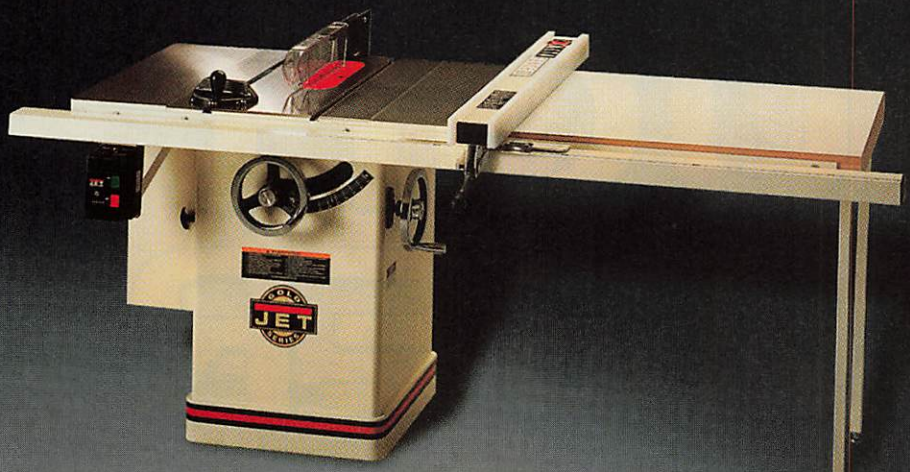

Tools pictured:

6" Closed Stand Jointer, $499*
2 extra knife sets FREE
SAVE $148

22" Closed Stand Shaper, $699*
12-piece carbide
router bit set FREE
SAVE $149

XACTA SAW™
left- and right-tilt, 3 HP, $1499*
Table and legs set FREE
SAVE $199

Contractor-Style Tablesaw,
with cast-iron wings, $649**
28-tooth carbide-
tipped blade FREE
SAVE $99**
**after $50 rebate

1000 CFM
Air Filtration System, $239*
Extra electrostatic
outer filter FREE
SAVE $39

Mini Lathe, $349*
18-piece
pen turning kit FREE
SAVE $129

Tools not shown:

18" Bandsaw, $1,099*
3 blades FREE
SAVE $49

16 ½" Drill Press, $399*
Mortising attachment
and 3 bits FREE
SAVE $176

15" Closed Stand Planer, $1199*
Extra knife set FREE
SAVE $59

1100 CFM Dust Collector, $299*
One tool
connection kit FREE
SAVE $49

1236 Wood Lathe
with stand, $579*
8-piece chisel set FREE
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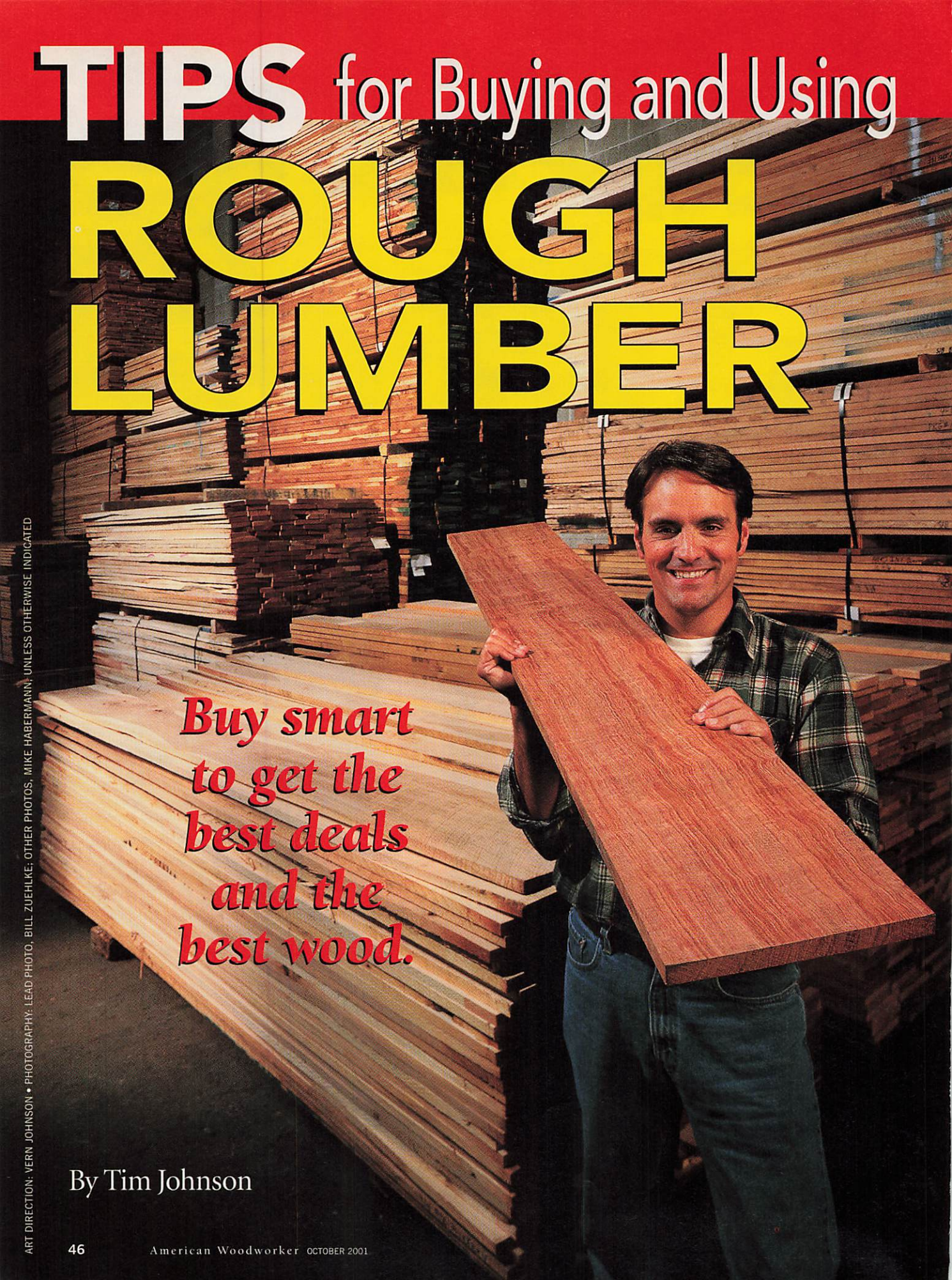
TIPS for Buying and Using ROUGH LUMBER



Buy smart to get the best deals and the best wood.

By Tim Johnson

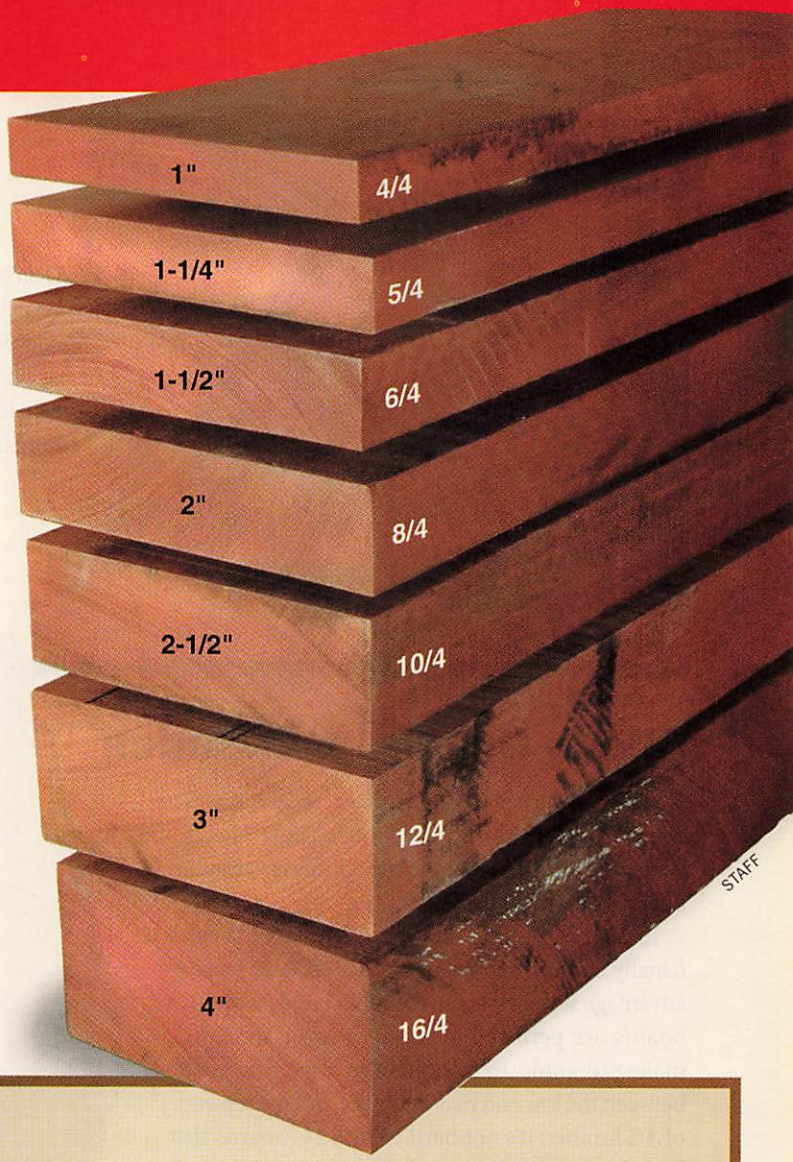
ART DIRECTION: VERN JOHNSON • PHOTOGRAPHY: LEAD PHOTO, BILL ZUEHLKE; OTHER PHOTOS, MIKE HABERMANN, UNLESS OTHERWISE INDICATED

Start Out Thick

Rough lumber thicknesses are measured in 1/4-in. increments. The thinnest rough-cut boards, labeled 4/4, and called four quarter, are 1-in. thick.

It's tough to get surfaced stock thicker than 13/16-in. from 1-in. rough stock. Plan to lose 3/16-in. (1/4-in. on thicker stock) when you plane a roughsawn board smooth.

Hardwood lumberyards commonly stock species in 4/4 and 8/4 thicknesses, with additional sizes available based on supply and demand.



STAFF

Be Prepared

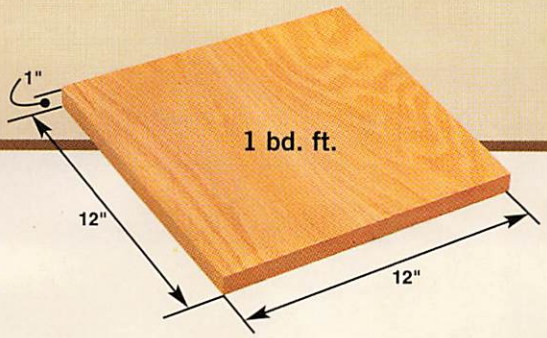
Take a tape measure and calculator with you when you go to the lumberyard so you can measure the boards you choose and figure out how much they'll cost. Because roughsawn boards come in random widths and lengths (no two are alike) they're measured by *volume*, which can be calculated by using a simple formula. The standard unit, a board foot (bd. ft.), measures 12-in. x 12-in. x 1-in.-thick, or 144 cubic inches.

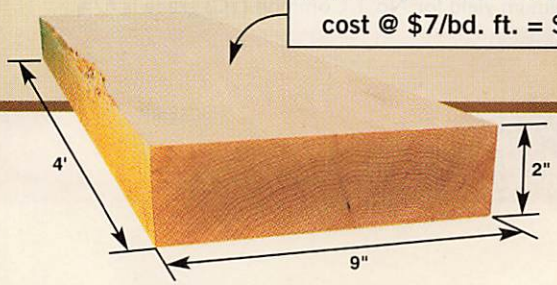
Because bd. ft. is a measure of volume, *any* combination of thickness (minimum 1 in.), width and length that equals 144 cubic inches also equals one bd. ft.

Rough lumber is sold based on its cost per bd. ft. Some species are more pricey than others, and thicker boards cost more per bd. ft. than thin ones. To determine cost, simply multiply the total number of bd. ft. in the boards you've selected by the bd. ft. price.

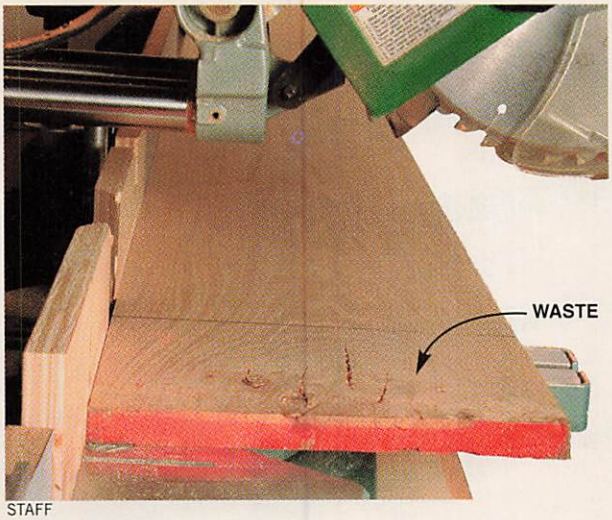
BOARD-FOOT FORMULA

Width (in inches) x **Length** (in feet) x **Thickness** (in inches) ÷ **12** = **Board Feet**





9" x 4' x 2" ÷ 12 = 6 bd. ft.
cost @ $7/bd. ft. = $42



STAFF

Buy Long

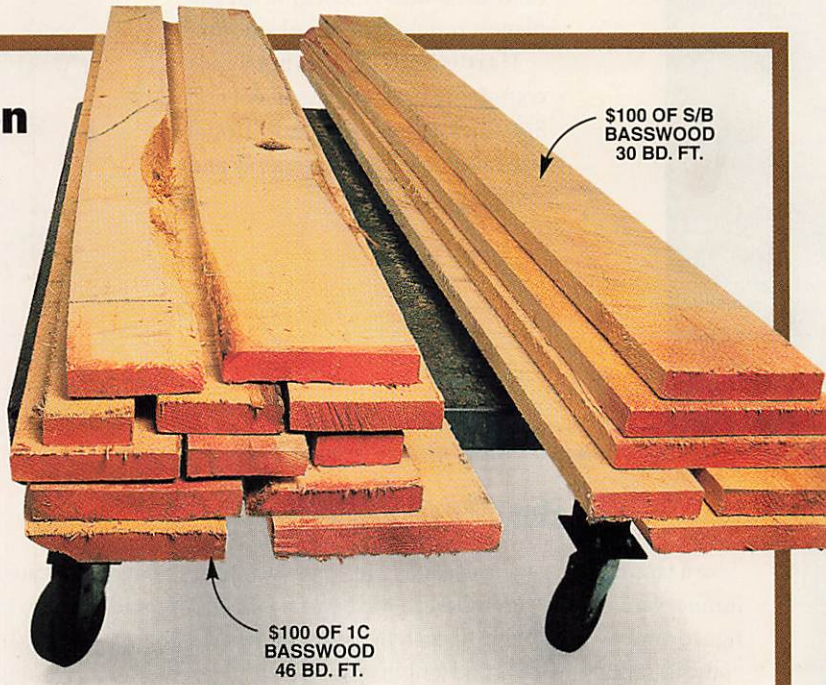
Don't expect to get an 8-ft. length out of an 8-ft. rough board. Even though roughsawn boards are regularly cut a couple of inches long, they usually contain checks, knots or wild grain that must be cut off. If you need finished 8-ft. lengths, you'll probably have to buy 9- or even 10-ft.-long boards.

Check Out No. 1 Common

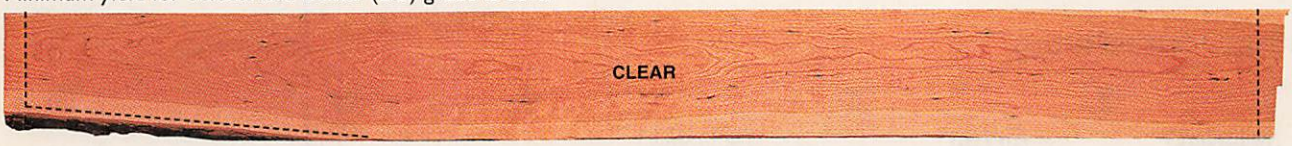
No. 1 Common (1C) lumber is always worth considering. It sits only one notch below Selects and Better (S/B), the best grade most lumberyards carry, but costs up to 40 percent less.

In general, 1C grade has more defects, and boards usually contain more waste. This reduces its cost advantage somewhat. On the other hand, some 1C boards are perfect, but too narrow or short to make S/B grade. In fact, there's a large gray area between the low end of S/B lumber and the top end of 1C lumber. It's not hard to find 1C boards that look just as good, if not better, than S/B boards. Buying 1C lumber is a great way to stretch your woodworking dollars.

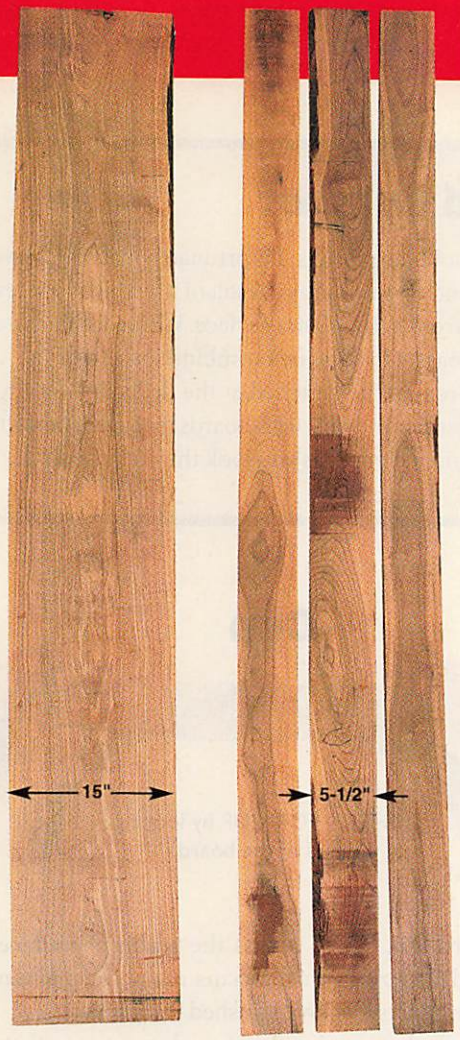
For more information on No. 1 Common lumber, see AW #84, December 2000, page 34.



Minimum yield for Selects and Better (S/B) grade is 83%.



Minimum yield for No. 1 Common (1C) grade is 67%.



Top-Grade Boards Aren't Always Pretty

Spectacular boards cost no more than ordinary ones, because lumber grades depend on yield, not aesthetics. The presence of off-color sapwood and funny-looking figure isn't a factor. The four boards at left all came from the same top-grade stack. In the eyes of the grader, the trio of slender boards is identical to the single wide one, because they contain the same amount of usable material. Three boards or one, they'll cost the same. How would you spend your money?

Buy More than Enough

It's a big mistake to buy the exact amount of wood your project requires. If you do, you're gonna come up short, because rough lumber isn't perfect, not even top-grade boards.

A common rule of thumb is to buy 15 to 20 percent more than you need. Some species, like red oak, consistently contain few defects, so you don't have to over-buy as much. Other species, like black walnut, require more insurance than the average.

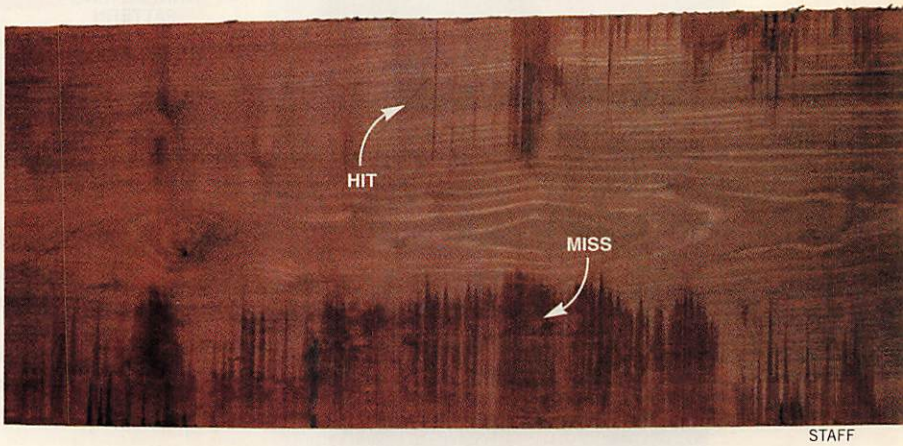
I usually don't bother with percentages, I just buy extra pieces. For example, if I'm going to build a table, I'll choose enough stock to make an extra leg. If the top requires seven boards, I'll buy eight.

Look for Hit-and-Miss

The landscape at the lumberyard is changing because stock surfaced hit-and-miss (H/M) is becoming common, and may eventually replace rough lumber altogether.

H/M planing skins the board's rough surfaces. This makes choosing good-looking boards easier because you can see what they look like, without having to guess. Even though I've been buying rough lumber for years, I still get fooled. It's just plain hard to see the figure pattern and color in a roughsawn board. H/M planing keeps you from buying ugly boards. H/M boards are also easier on your tools, because the rough top layer, which often contains dirt and other junk, has been removed.

Here's the bad news. First, you've got less thickness to work with. H/M-surfaced boards are 1/16-in. thinner than the rough thickness (4/4 H/M stock is 15/16-in. thick). Second, H/M boards still need to be finish-planed. Their surfaces are coarse and usually contain portions that are still rough (hence the name). And third, H/M planing doesn't flatten warped boards.



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Tame Warped Lumber

Common sense tells you to choose flat boards and avoid the pretzels. Unfortunately, flat roughsawn boards are sometimes hard to find. Lots of boards end up warped as a result of the drying process. In lumber lingo, warp is defined as any deflection from a flat, planar surface. Warped boards can be cupped, bowed, crooked or twisted. A single board can contain a combination of warps.

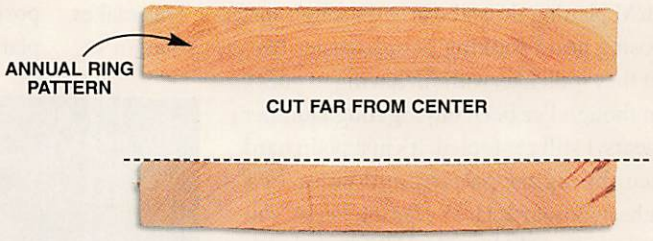
Luckily, most warped boards can be flattened, if the deflection isn't too severe. Knowing how to identify and deal with boards that aren't perfectly flat will give you many more choices as you look through the stack.

Cup

CHECK FOR CUP by looking at the end of the board.

A board that bends across the width of its face is cupped. Cupping, which occurs mainly in plainsawn lumber, affects a board's finished thickness.

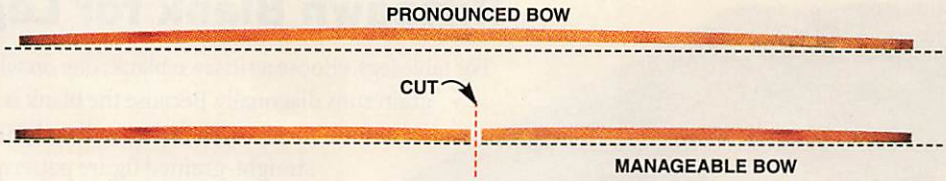
Boards that are slightly cupped are easy to flatten. Joint them with the concave side down. This keeps both outside edges in contact with the jointer's bed, for stability. To flatten a severely cupped board without sacrificing its thickness, rip it in half and joint both pieces separately. Don't rip a cupped board on your tablesaw, however. It's too likely to cause a kickback. Use a bandsaw, circular saw or jigsaw. Glue the pieces back together, after jointing their mating edges. Then make a final smoothing pass on the glued-up face.



CUPPING IS MORE LIKELY on plainsawn boards cut close to the center of the tree. You can determine where the board came from by looking at the annual-ring pattern shown on the end grain. Boards showing wide, shallow arcs are best. Cupping almost always occurs on the bark side of the board, away from the center.

Bow

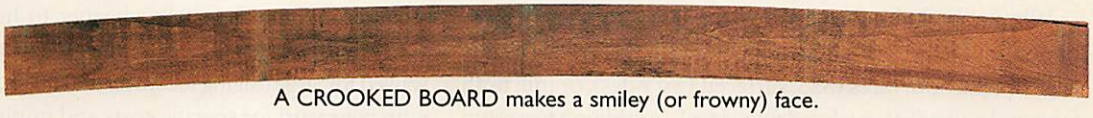
BOW IS EASY TO SEE when you sight down the edge of the board.



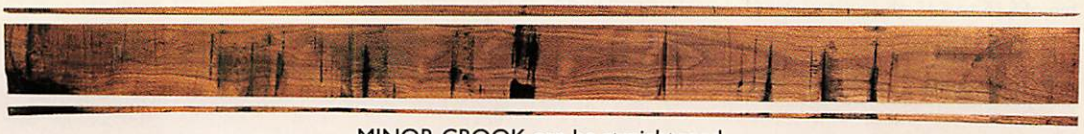
A board that bends across the length of its face is bowed. You'll lose length when you flatten bowed boards, because you have to remove more from the ends than the middle. Joint with the bowed side down, and don't press the board flat against the jointer bed. The only way to deal with a board with a pronounced bow is to cut it into shorter lengths. The short pieces will still bow, but not as much, so they'll be easier to flatten. If the bow is confined to one end of the board, cut it off or make repeated jointing passes on that end only.

Crook

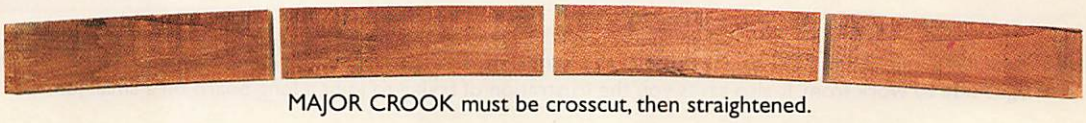
A board that bends along its length is crooked. Straightening a crooked board reduces its width. Boards with a minor crook are common. They can be straightened by jointing and/or ripping. (Again, don't rip a crooked board on the tablesaw without a sled to hold it; kickback is too likely.) Jointing or ripping won't work on a board with a major crook—you'd end up with nothing. Instead, cut the board into short pieces.



A CROOKED BOARD makes a smiley (or frowny) face.



MINOR CROOK can be straightened.



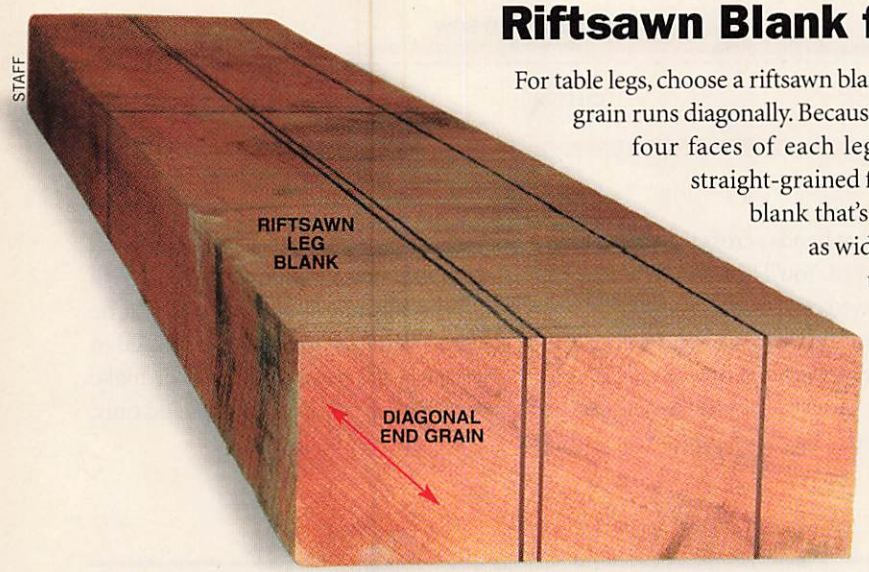
MAJOR CROOK must be crosscut, then straightened.

Twist

A board with one high corner has twist. It's best to let twisted boards be someone else's nightmare. They're difficult to flatten, and even if you're successful, the twist has a tendency to return. If you must use a twisted board, cut it as short as possible, to minimize the deflection.

SIGHT DOWN THE FACE of a board. If the opposite ends aren't parallel, it's twisted. Put it back.

Riftsawn Blank for Legs



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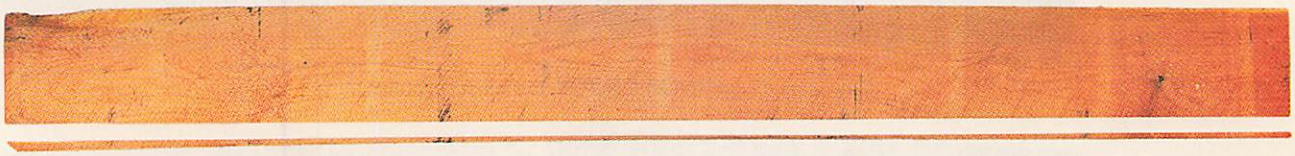
For table legs, choose a riftsawn blank; one on which the end grain runs diagonally. Because the blank is riftsawn, all four faces of each leg will exhibit the same straight-grained figure pattern. Look for a blank that's slightly more than twice as wide and slightly more than twice as long as one leg, so you can get all four legs from the same piece.

RIFTSAWN FACES show straight, vertical figure.

Take Advantage of Milling Services

Rough lumber is rarely flat or straight. Milling your own is backbreaking work, takes forever and produces gobs of sawdust.

Why not let the lumberyard do it for you? Most yards will rip one edge of a rough board straight (called SL/E, straight-line edge), plane both faces (S2S, surfaced two sides), or mill both faces and edges (S4S, surfaced four sides). In addition to a setup fee of $15 to $45, the cost ranges from about 15 to 30 cents per bd. ft., depending on which type of milling you choose. It's not worth the expense to have only a few boards milled—for small amounts, it's usually cheaper to head straight to the yard's inventory of surfaced lumber. The set-up fee usually gets waived for large milling jobs, over 150 bd. ft., for example. Check with your yard for specific costs and minimum amounts.

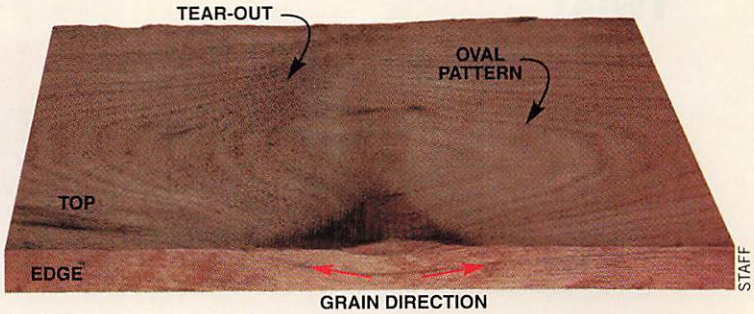


A STRAIGHT-LINE EDGE CUT (SL/E) made at the lumberyard makes ripping and crosscutting at home safer because it gives you a straight side to work from. It also saves you the frustration of trying to joint a long board on a small jointer.

Beware of Ovals

An oval figure pattern on the board's surface signals a change in grain direction that may cause significant tear-out. You'll be planing with the grain on one side of the oval, but going against it on the other, so there's gonna be trouble.

Instead of sanding like mad to get rid of tear-out, use a scraper or hand plane. Check the edge of the board to see how and where the grain changes, then smooth the oval by working from opposite directions, following the grain.



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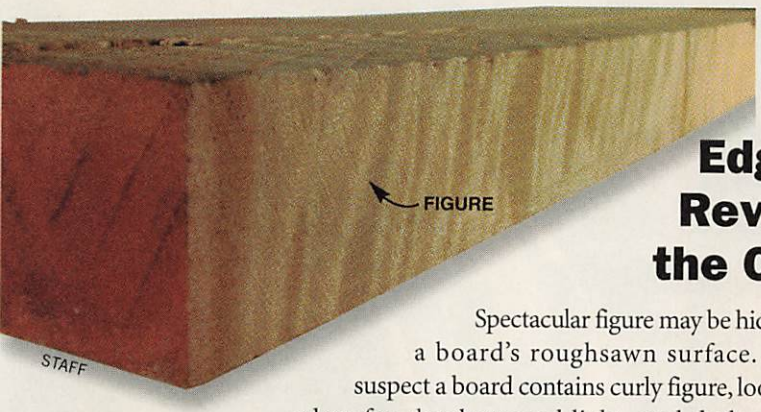

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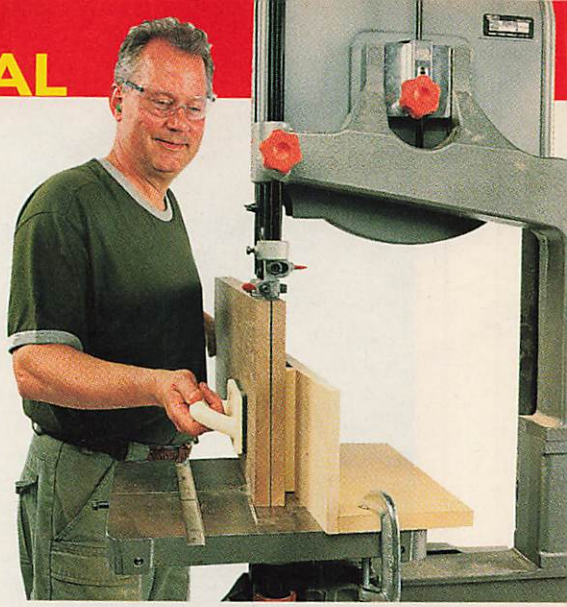
Edges Reveal the Curl

Spectacular figure may be hidden by a board's roughsawn surface. If you suspect a board contains curly figure, look at its edges for closely spaced light- and dark-colored stripes. Pronounced stripes indicate heavy figure. You can check an entire stack of boards for figured ones just by looking at the stack from the side.

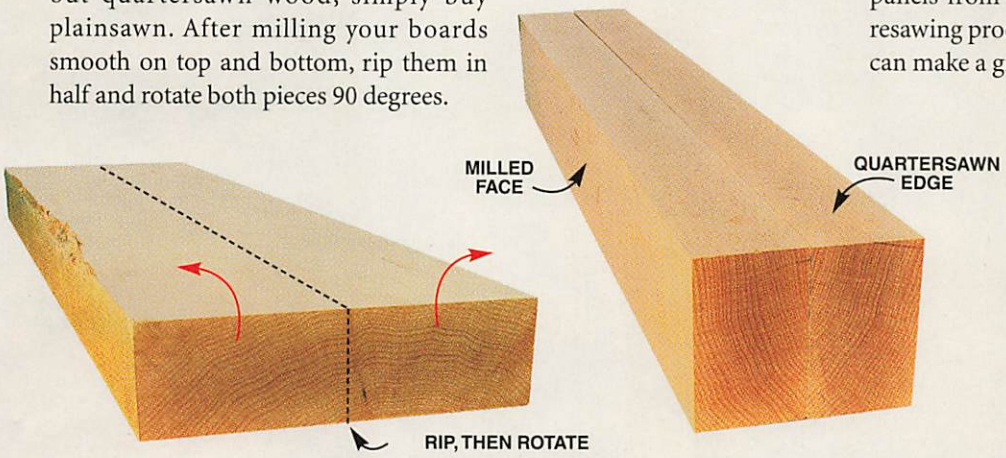


Resawing Saves Money and Material

Even though thicker wood costs more, you can save money by using it effectively. Say you need two 1/2-in.-thick panels. Instead of milling two pieces of 4/4 stock, and wasting almost half of each board, resaw a pair of panels from a single piece of 6/4. Besides, resawing produces bookmatched pieces that can make a great-looking pair of doors.

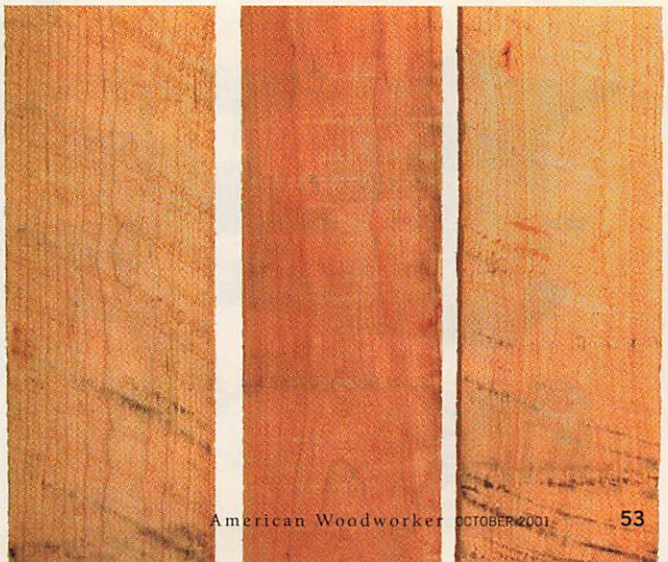
Do-It-Yourself Butcherblock

Butcherblock tops are best made from quartersawn wood, so they don't expand and contract as much. Instead of buying or searching out quartersawn wood, simply buy plainsawn. After milling your boards smooth on top and bottom, rip them in half and rotate both pieces 90 degrees.



Be Fussy About Color

One off-color board can ruin the appearance of an entire project. Trust me, that dark (or light) board will bug you every time you see it! You can usually tell when boards don't match, even in the rough. Stand them alongside one another in good natural light, so you can compare. AW



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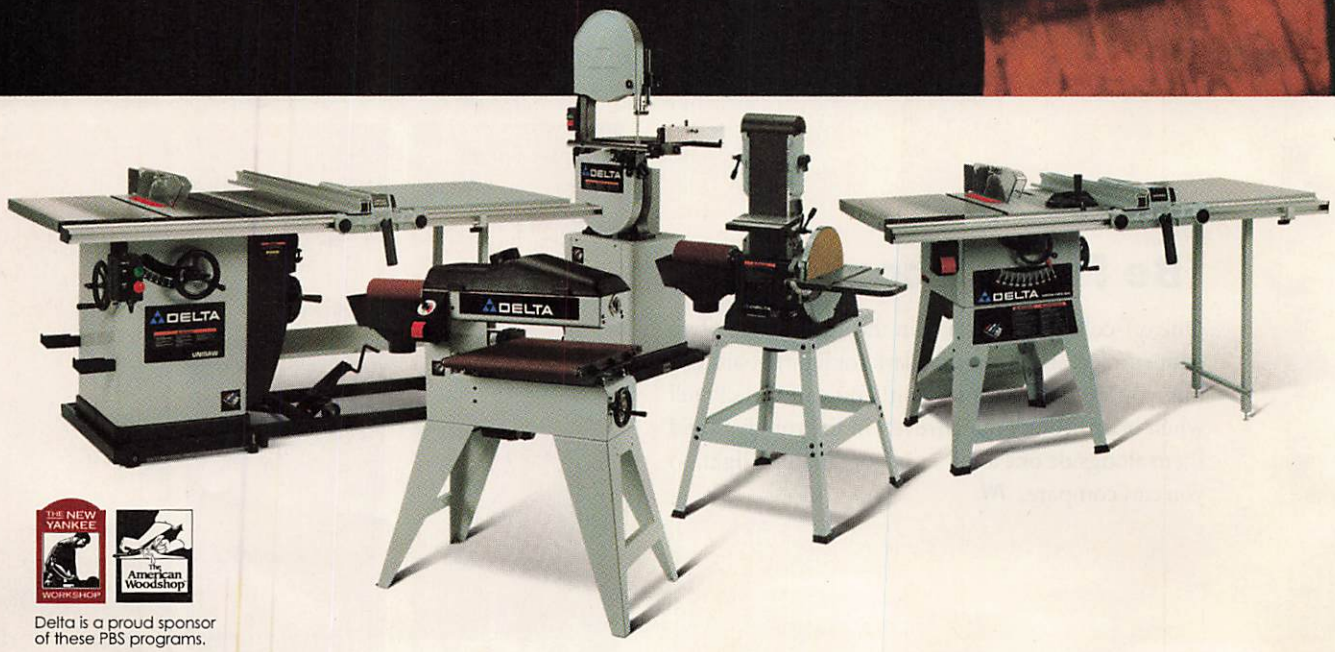

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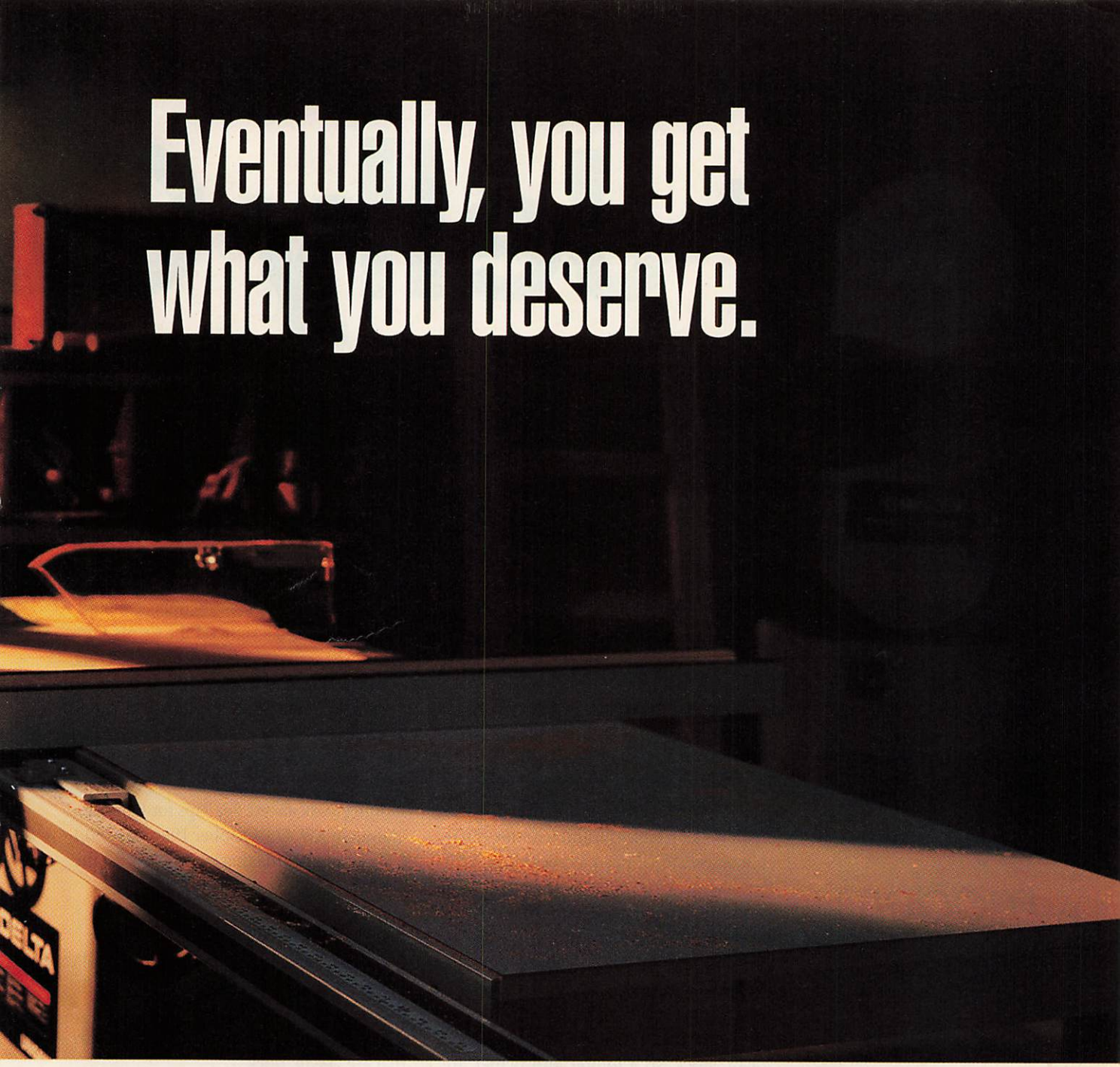

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Pennsylvania is the home of fine stands of walnut trees and a rich tradition of Amish country furniture. We've updated an 1840s Amish jelly cupboard by substituting plywood for solid wood and tablesaw joinery for hand-cut dovetails.

By Tom Caspar

Tools and Materials

If you've got a tablesaw and a router you're in business. You'll need a crosscut sled for your saw to accurately cut large pieces of plywood and a router table to make the molding. A dado set is a must for cutting the joints, but you won't need a pocket screw jig or special screws. We used a Forstner bit and standard flat-head tapping screws.

You can build this project with pre-planed 3/4-in. stock, so a jointer and planer are optional. You'll need straight boards, so pick your lumber carefully. This cupboard requires about 25 to 30 bd. ft. of solid walnut ($125), 35 bd. ft. of a secondary wood such as yellow poplar ($90), one sheet of 3/4-in. and one sheet of 1/4-in. veneer-core walnut plywood ($200). (Plywood with a particleboard or MDF core isn't strong enough for this cabinet's joinery.) The hardware and pre-turned feet are an additional $65.

Getting Started

Take a long, hard look at your sheet of 3/4-in. plywood before cutting it up. Its face is a series of bookmatched veneers separated by seams or glue lines. To create the illusion that your cabinet is made of glued-up solid wood, the front edges of the cupboard's sides and top should fall right on the seams. Our cutting diagram (Fig. L, page 66) is just one example of how to break up the sheet.

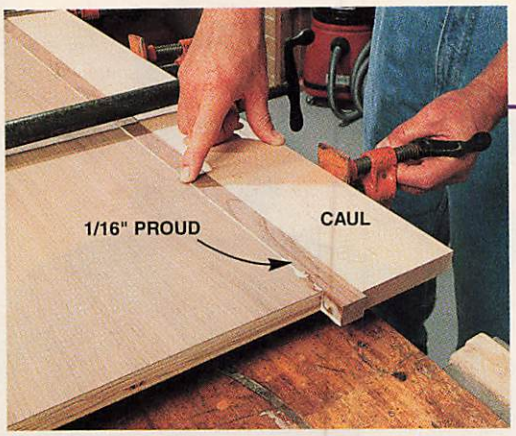
Before you cut up your solid wood, check its color against your plywood by wetting both with water, alcohol or mineral spirits. (If it doesn't match, you'll have some tricky staining work ahead. See Tips for Finishing Walnut in AW #75, October 1999, page 60.) Choose the boards that match best for the edging.

Edging the Sides and Bottom

1. Cut the sides (B1) and bottom panel (H1) to exact width and rough length (see Fig. L, page 66).
2. Cut the edging (B2 and H2) from boards that are 3/4-in. thick.
3. Glue the edging to the sides and bottom panels (Photo 1). Insert a 3 to 4-in.-wide caul between the clamp and the edging to spread out the pressure. The edging is 1/8-in. thicker than the plywood, so you don't have to worry now about making it perfectly even. But before you tighten the clamps, make sure the edging is proud of the plywood on *both* sides. Remove the squeezed-out glue before it dries.
4. Even up the edging with the plywood

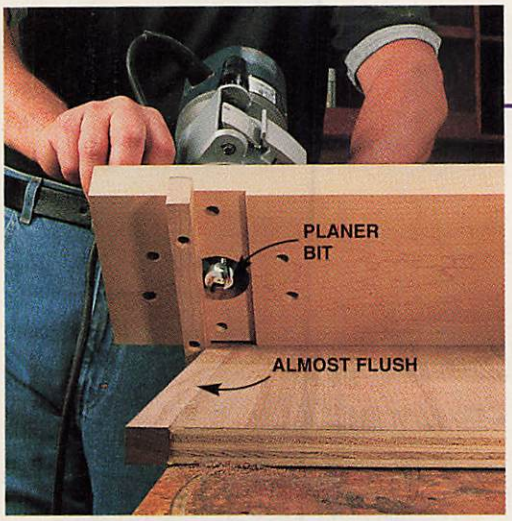
ART DIRECTION: PATRICK HUNTER • PHOTOGRAPHY: MIKE HABERMANN, UNLESS OTHERWISE INDICATED • ILLUSTRATION: FRANK ROHRBACH

pboard



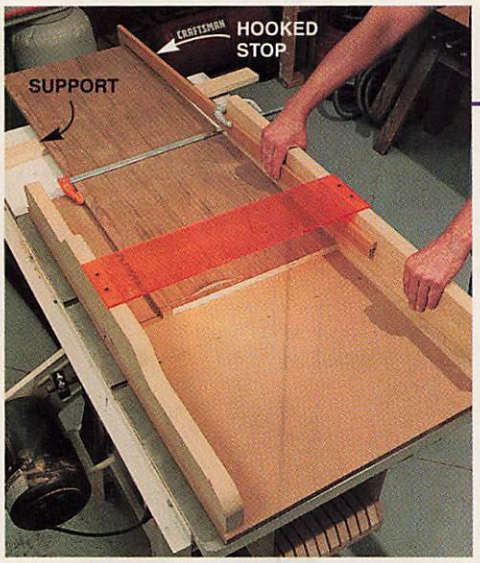
1

Glue solid edging to the plywood panels. Spread clamp pressure with a caul. A tight glue joint makes your case look like it's built entirely out of solid wood.



2

Even up the edging with a router jig. You can get darn close with the router, but to avoid cutting into the thin veneer, take the last fraction off by sanding or scraping.



3

Square the plywood sides with a crosscut sled. This tablesaw jig (see AW #75, October 1999, page 38) is by far the best way to make an accurate cut on wide panels. Sides that aren't square will throw the whole case out of whack.

(Photo 2). This isn't a job for a belt sander, because it's too easy to accidentally cut through the plywood's thin veneer. A router jig works great. Make it extra long to offset the weight of the router. Install a dado or planer bit (see Sources, page 67) in the router and set it a paper thickness above the base of the jig. This style of router bit makes a cleaner cut than a standard straight bit.

5. Crosscut the sides and bottom to exact length with a crosscut sled (Photo 3).

Building the Web Frames

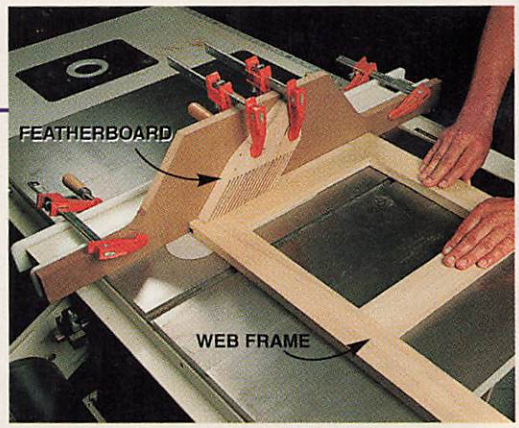
1. Cut the fronts and backs (C1) to the exact width and 1/4-in. longer than the final length. Cut the stretchers (C2) to exact width and length.
2. Join the web frame parts with homemade spline or biscuits. Mark centerlines for biscuits (Fig. C, page 60) and cut #20 biscuit slots.
3. Glue the two web frames. Be sure they're not twisted.
4. Crosscut the web frames to exact length.

Cutting the Joints

Dadoes

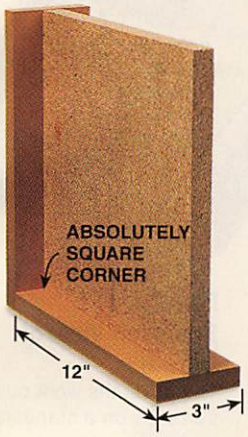
1. Cut dadoes for the drawer dividers (C3) in the web frames (see Fig. C, page 60, for all joinery dimensions).
2. Cut identical dadoes in the case's sides to hold the lower web frame and the bottom.

4



Cut rabbets on the ends of the web frame with a dado set. Using a featherboard keeps your hands out of harm's way and guarantees a consistent cut, which is essential for a tight-fitting joint.

Fig. A
Squaring Jig
This simple device makes glue up so easy it's worth its weight in gold. Make four from MDF or plywood and you'll be guaranteed a square case.



Pocket screws are a great substitute for long clamps.

Rabbets

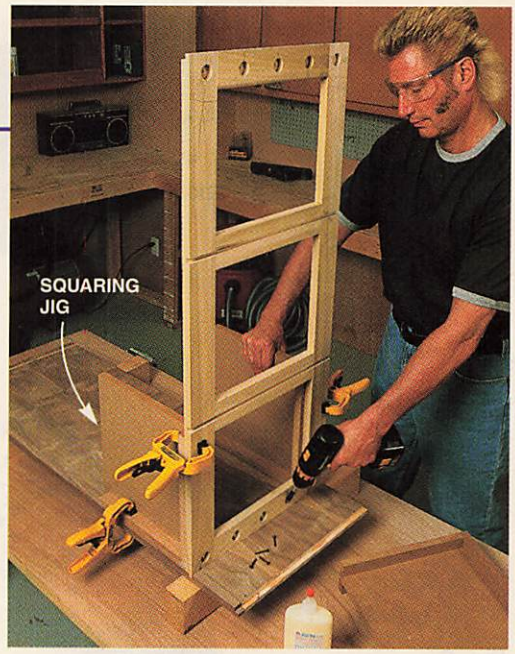
1. Cut rabbets on the ends of both web frames (Photo 4). Note that the two web frames have rabbets on different faces. When you cut the rabbets, the dadoes are facing *up* on one web frame and facing *down* on the other.
2. Cut rabbets to hold the upper web frame in the top of both cabinet sides.
3. Cut rabbets on the ends of the bottom panel (H1).
4. Cut rabbets to hold the back (Fig. D, page 60).

Screw Pockets

1. Use a Forstner bit (see Sources, page 67) in your drill press, or a spade bit in a portable drill, to bore the large relief holes in both web frames and the bottom panel (Fig. H, page 61). Setting up a fence on a large auxiliary table makes this operation much easier on a drill press (see Drill Press Table in AW #86, April 2001, page 111).

text continued on page 62

5



Glue and screw one web frame at a time to the cabinet side. Hold each frame exactly upright with large squaring jigs clamped in place.

6

Add the second side to the cabinet. You don't need dozens of clamps and cauls to glue this wide case together. Pocket screws do all the work.

7

Attach the top web frame. It fits right on top of the drawer dividers and the sides of the case.

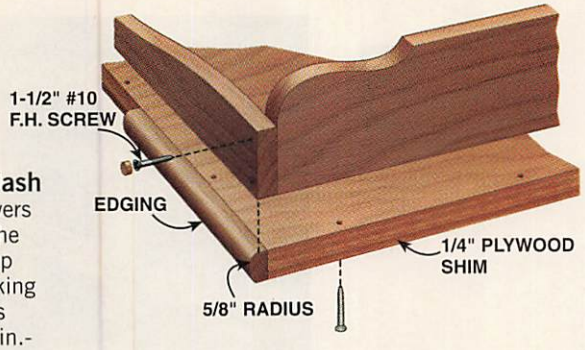


Fig. B
Top and Backsplash
The backsplash covers the joint between the built-up plywood top and its edging, making the top look like it's made entirely of 1-in.-thick solid wood.

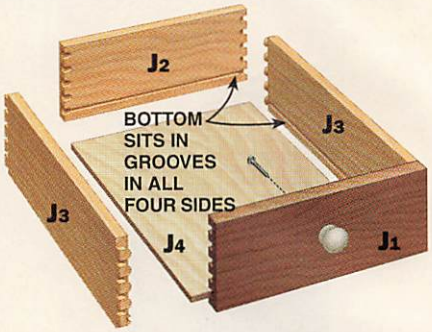


Fig. E
Exploded View of Drawer
The dovetails work out perfectly on a standard router jig.

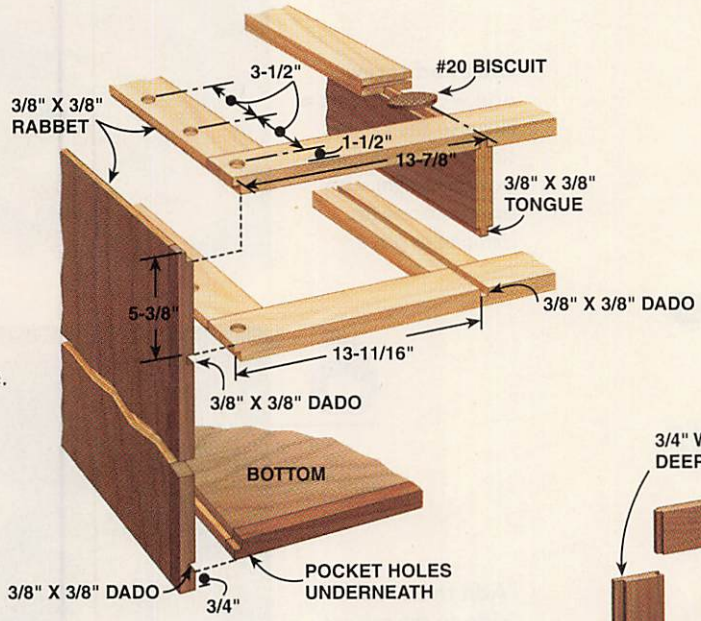


Fig. C
Joinery Dimensions
All you need is a dado set to make the major joints of this large case.

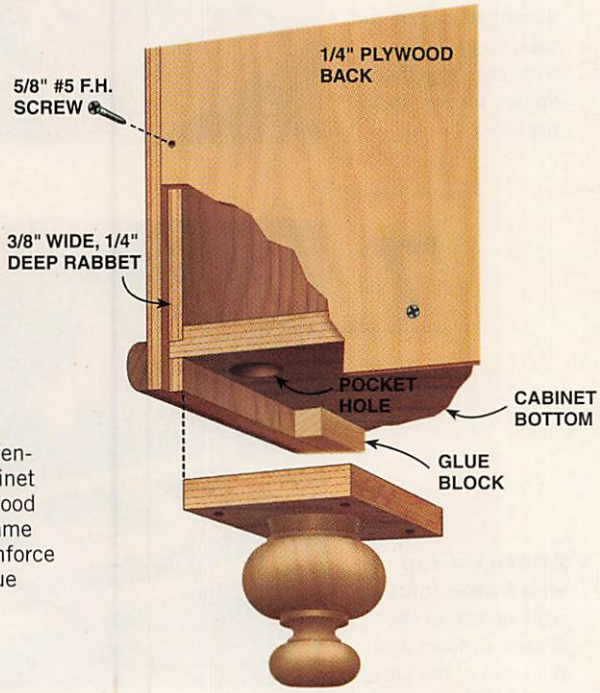


Fig. D
Detail of Back
The secret to stiffening this large cabinet is to screw a plywood back to all the frame members and reinforce the joints with glue blocks.

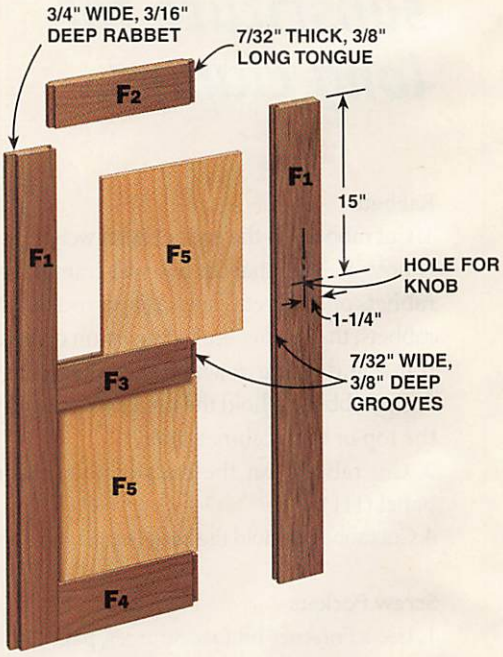
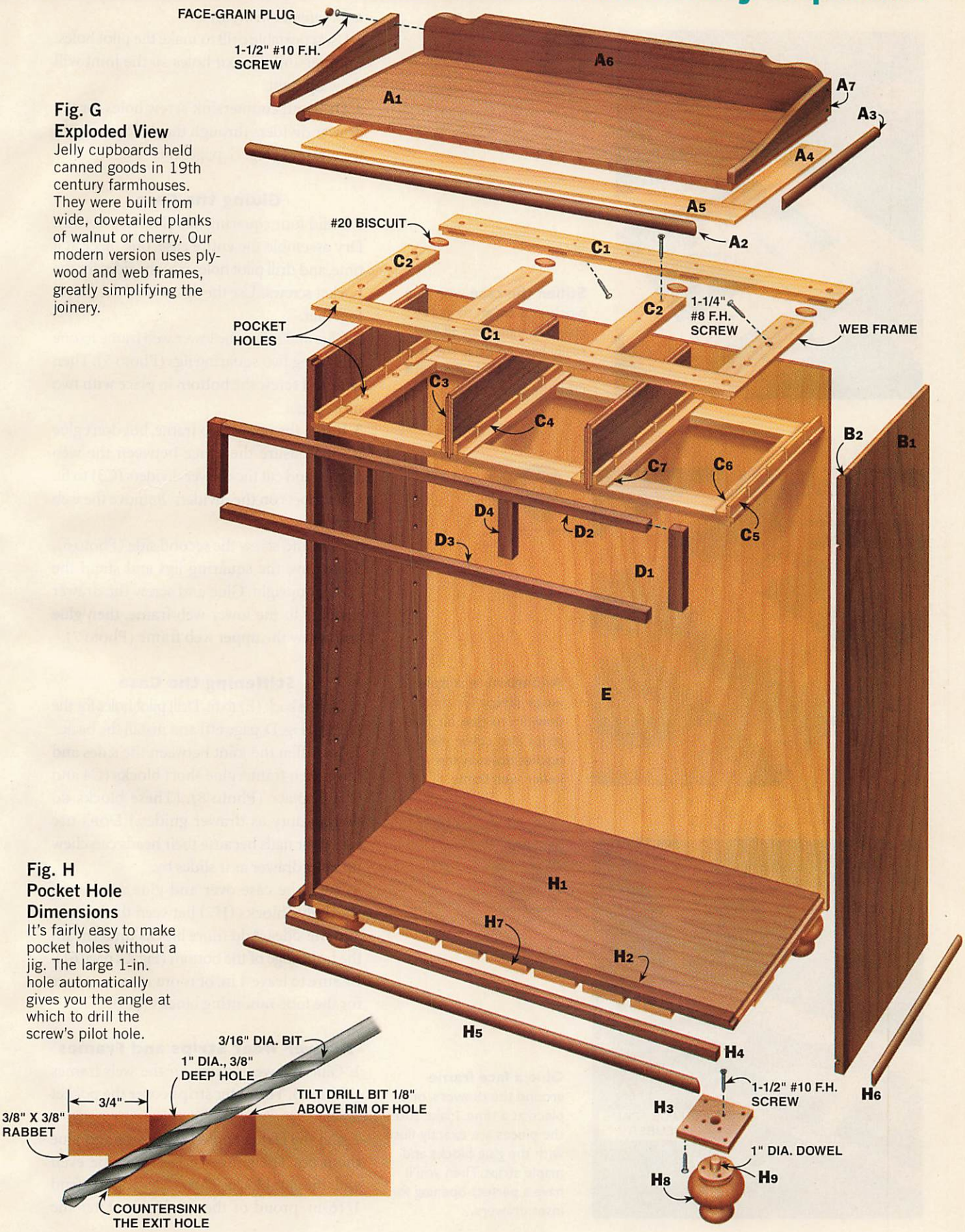
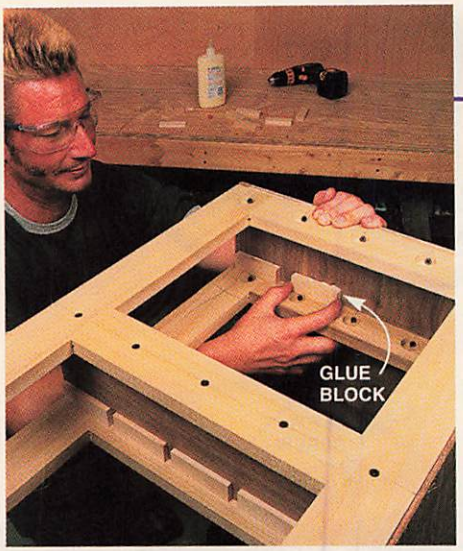


Fig. F
Back Side of Door
Plywood panels glued to the frames make these doors strong and lightweight.

Fig. G
Exploded View
Jelly cupboards held canned goods in 19th century farmhouses. They were built from wide, dovetailed planks of walnut or cherry. Our modern version uses plywood and web frames, greatly simplifying the joinery.

Fig. H
Pocket Hole Dimensions
It's fairly easy to make pocket holes without a jig. The large 1-in. hole automatically gives you the angle at which to drill the screw's pilot hole.





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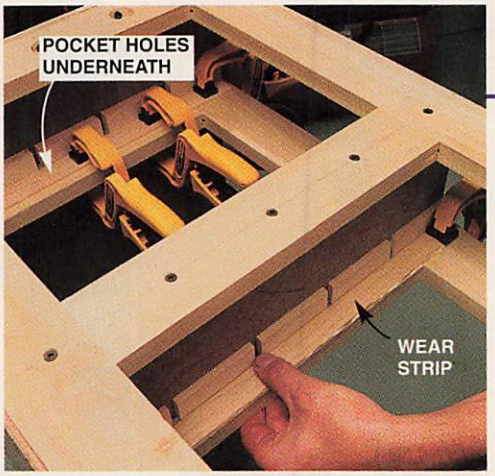
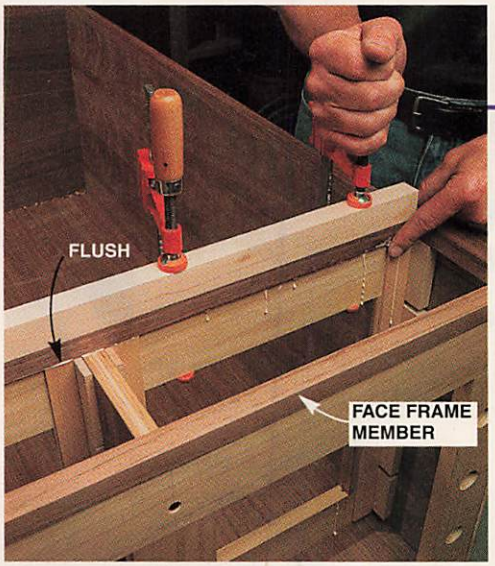
Stiffen the case with glue blocks. It's tough to get a clamp in there, but all you really have to do is rub the small blocks back and forth until the glue sticks.



9

Add durable maple wear strips for the drawers to ride on. The strips also cover the pocket holes in the lower web frame.



10

Glue a face frame around the drawers, one piece at a time. Make sure the pieces are exactly flush with the glue blocks and maple strips. Then you'll have a perfect opening for inset drawers.

text continued from page 59

2. Use a portable drill to make the pilot holes. Countersink the *exit* holes so the joint will draw up tight.
3. Drill and countersink screw holes for the drawer dividers through the dadoes in both web frames (Fig. G, page 61).

Gluing the Case

1. Build four squaring jigs (Fig. A, page 59). Dry assemble the entire case, one piece at a time, and drill pilot holes into the sides for the pocket screws. Use the jigs to hold the pieces together.
2. Glue and screw the lower web frame to one side using two squaring jigs (Photo 5). Then glue and screw the bottom in place with two more jigs.
3. Install the upper web frame, but don't glue it in. Measure the space between the web frames and cut the drawer dividers (C3) to fit. Cut rabbets on the dividers. Remove the web frame.
4. Glue and screw the second side (Photo 6).
5. Remove the squaring jigs and stand the cabinet upright. Glue and screw the drawer dividers to the lower web frame, then glue and screw the upper web frame (Photo 7).

Stiffening the Case

1. Cut the back (E) to fit. Drill pilot holes for the screws (Fig. D, page 60) and install the back.
2. To stiffen the joint between the sides and lower web frame, glue short blocks (C4 and C5) in place (Photo 8). (These blocks do double duty as drawer guides.) Don't use screws or nails because their heads can chew up your drawer as it slides by.
3. Turn the case over and glue a series of short glue blocks (H7) between the bottom and the sides. Add more blocks underneath the front edge of the bottom (Fig. G, page 61). Be sure to leave 4 in. of room at each corner for the foot-mounting blocks (H3).

Drawer Wear Strips and Frames

1. Glue the wear strips on the web frames (Photo 9). The outer strips cover the pocket holes.
2. Cut the frame ends (D1) to size and glue them on. Their inner edges must be even with the glue blocks. Their outer edges extend 1/16-in. proud of the case's side. After the

glue dries, even up these edges with the same router jig you used for edging the plywood.
3. Cut the long top and bottom pieces (D2 and D3) to fit between the side pieces (Photo 10) and glue them on. Carefully position the bottom piece even with the wear strips.
4. Cut the middle pieces (D4) to fit. Glue them on after fine-tuning the width so both sides are flush with the drawer guides.

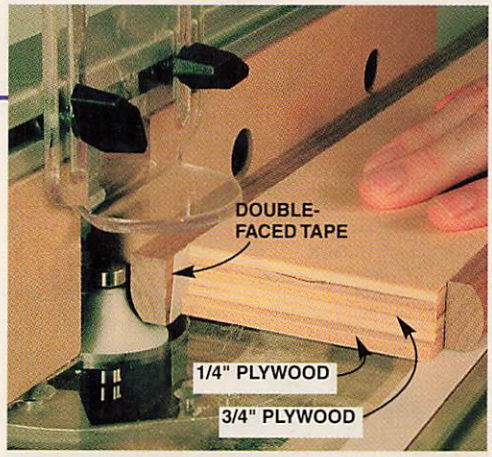
Making the Bottom Molding

1. Saw three 1/2 in. x 1-in. molding blanks that are a couple of inches extra long. Make a 1-in. thick, 3-in.-wide temporary support board by gluing together 3/4-in. and 1/4-in. plywood. (They may add up to only 15/16 in., but that's okay.) Attach the molding blanks to the support board with double-faced tape (Photo 11).
2. Install a 5/8-in.-radius bit (see Sources, page 67) in your router table (Fig. J, at right). The opening in your router table must be at least 1-3/4-in. dia. to handle this bit. Rout the molding and pry it off the support board.
3. The front molding is attached to a backer (H4). Cut the backer to fit flush with the sides of the case.
4. Cut miters on the front molding (H5) to line up with the ends of the backer. Glue the two together and even up their top edges.
5. Glue this assembly to the case, even with the bottom edges of the glue blocks. This leaves 1/2 in. of the bottom's front edge exposed as a stop for the doors.
6. Cut the side moldings (H6) 1 in. or so longer than their final length. Miter one end of each piece and test the fit (Photo 12). Tweak the miter if necessary, then cut the molding to length and glue it on.

Attaching the Feet

1. Cut the foot mounting blocks (H3) from leftover walnut plywood. Drill and countersink holes through the blocks for screws to attach the feet and the blocks to the case. Drill holes in the center for 1-in. dowels.
2. Glue and screw the feet to the blocks (see Sources, page 67). Use epoxy because it works better than other glues on end grain.
3. Once the glue is dry, continue drilling the dowel hole 2-in. deeper into the foot. Glue in the dowel with epoxy (Photo 13).

11



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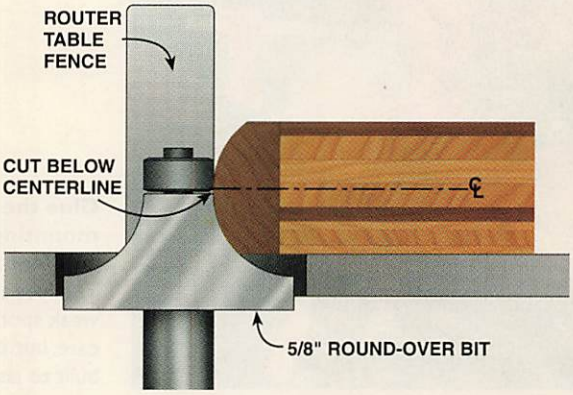
Shape the narrow moldings on a router table. Tape two pieces to a built-up, 1-in.-thick support board so your fingers are well away from the action.

Fig. J
TIP: Molding Setup
When you round the top and bottom of a molding, set the cutter slightly *below* the centerline so a small uncut section in the middle of the molding rides along the fence. This ensures a smooth, continuous cut and prevents snipe at the end of the molding. Sand the molding when you're done to round over the uncut section.



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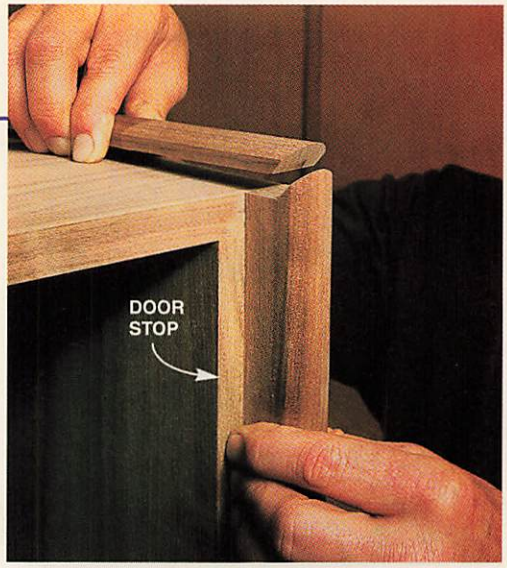
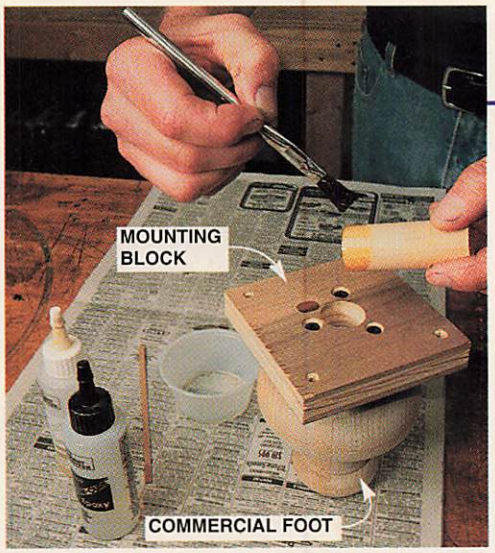


Fit the molding to the bottom of the case. Molding protects the fragile ends of the plywood sides from everyday wear and tear, such as bumps from a vacuum or snags from a dust cloth.

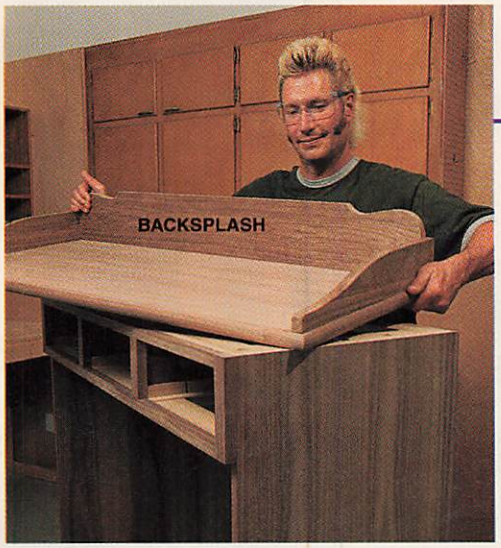


13

Epoxy a large dowel into a commercially made foot to securely attach it to the mounting block. It's hard to get a large dowel to fit tightly, but epoxy will adequately fill the gaps for a good bond. It also adheres to the foot's end grain.

14

Glue the plywood mounting blocks and feet to the case. The feet are often a weak spot in a large case, but these are built to last.



15

Fasten the top to the case. The backsplash is screwed, but not glued, to the top. You can remove it before finishing the top so you won't have so many nasty corners to deal with.

4. Glue and screw the mounting blocks and feet to the bottom of the case (Photo 14).

Making the Top and Backsplash

1. Cut the top panel (A1) to size. Cut the shims (A4 and A5) from leftover plywood. They can be pieced together from short stuff.
2. Glue the shims underneath the top. They overhang the top by 1/8 in. all around. Use a router and flush-trim bit to even them up.
3. Glue mitered edging to the *front* of the top. Even it up with the router jig you used on the sides of the case. Then add edging to the sides of the top and rout it even. (You can't even up all three pieces of edging in one shot because the jig can't cut into a corner.) Radius the edging on the router table with the same setup used on the bottom molding (Fig. J, Page 63).
4. Rip the backsplash pieces and trim to length. Cut the curves with a jigsaw or bandsaw (Fig. K, page 65) and fair them with a half-round file.
5. Counterbore holes for plugs to cover the screws that join the backsplash together. Face-grain plugs blend in better than end-grain plugs. You can buy them ready-made or make your own with a tapered plug cutter (see Sources, page 67).
6. Set up the backsplash pieces with the squaring jigs and glue and screw them together. Glue and even up the plugs.
7. Remove the 1/4-in. plywood back from the case. Drill angled holes through the top web frame for the screws that'll fasten down the top (Fig. G, page 61). To get the angle right, start the holes from the *bottom* side of the web frame. Countersink quite deeply, so there's no chance of the screw heads catching on the drawers. Fasten the backsplash to the top and the top to the case (Photo 15).

Making the Drawers

1. Cut the parts to fit your case. Rip all the pieces 1/16-in. narrower than the opening to allow for seasonal movement. For a tight-fitting drawer, the fronts should be 1/32 in., or less, shorter than each opening. Make the backs 1/16-in. shorter than the fronts. This tapers the drawer box, making it easier to fit.
2. Cut grooves for the drawer bottoms on the tablesaw and rout the parts on a dovetail jig (Photo 16).

3. Fit the bottoms and glue the drawers together. Glue stops (J5) at the back of the case so the drawers stop flush with the front.

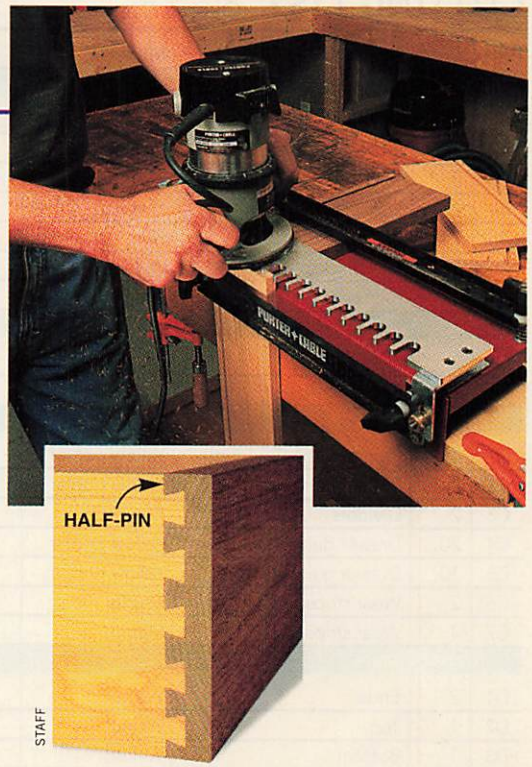
Making the Doors

1. Cut all the parts to the sizes indicated in the Cutting List, page 66. Your doors will be oversized 1/4 in. in length and 1/8 in. in width. Cut grooves for the 1/4-in.-plywood panels in the stiles (F1) and rails (F2, F3 and F4). Most 1/4-in. plywood is actually 1/32-in. thinner. A dado set can't make a groove that narrow, but two passes with a standard blade works just fine.
2. Cut tenons to fit (see Foolproof Tenons, AW #88, August 2001, page 66). Assemble the door and measure the distance from the bottom of one groove to the bottom of the opposite groove. Cut panels that are 1/16-in. shorter in length and width than these measurements. Glue the doors (Photo 17).
3. To custom-fit your case, cut the doors in two stages. Aim for a 1/16-in. gap at the top and bottom and in between the doors. First, trim both ends on your crosscut sled (this will even up all the rails and stiles). Second, take a little bit off the sides.

Hanging the Doors

1. Cut rabbets in the outer stiles with a dado set (Fig. F, page 60). Make the rabbets the full depth of the hinge when closed (about 3/16 in.) and 3/4-in. wide.
2. Cut the continuous hinge to length at the nearest knuckle, butt it into the rabbet and drill pilot holes with a self-centering bit (see Sources, page 67). This indispensible bit is key to successfully hanging the door because it automatically centers the pilot holes. Install a few screws.
3. Lay the case on its back and support the door on a stool (Photo 18). Line up the opened hinge so it's flush with the inside edge of the case. Install a screw at either end and try out the door. If it closes perfectly, congratulations! If it doesn't, loosen one of the screws, shift the door and put two new screws in neighboring holes. Now retighten the first screws. It's that easy.

16



Rout the drawer parts on a standard dovetail jig. We've sized the drawers so the dovetails come out with perfect half-pins at the top and bottom.

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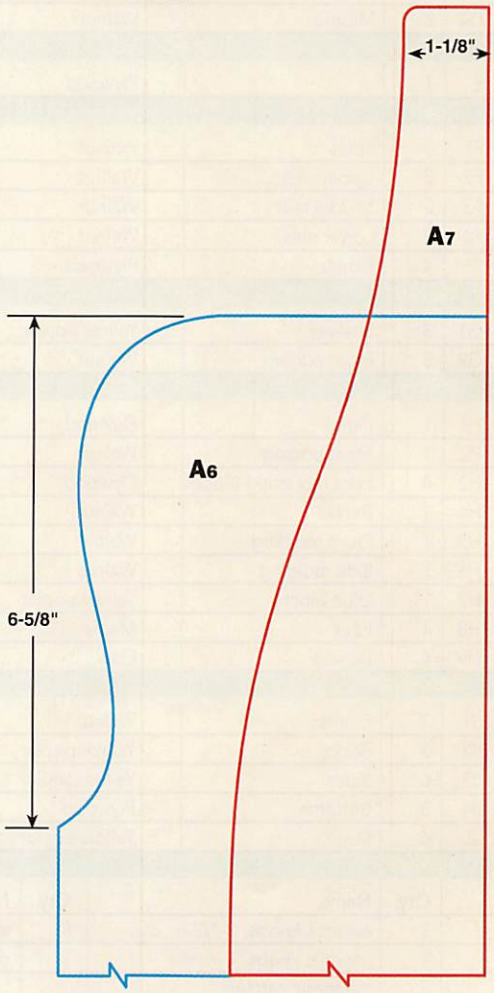


Fig. K
Backsplash Curves
Enlarge this pattern approximately 250 percent on a copy machine. Make sure the length and width measurements of the pattern enlargement are accurate.

CUTTING LIST Overall Dimensions: 57-1/2"H x 43"W x 18-1/2"D

Part	Qty.	Name	Material	Dimensions
Top				
A1	1	Panel	Plywood	3/4 x 17-3/4 x 41-1/2
A2	1	Front edging	Walnut	3/4 x 1 x 43
A3	2	Side edging	Walnut	3/4 x 1 x 18-1/2
A4	2	End shims	Plywood	1/4 x 3 x 12
A5	2	Front, back shims	Plywood	1/4 x 3 x 41-3/4
A6	1	Rear backsplash	Walnut	3/4 x 5-1/2 x 40-1/2
A7	2	Side backsplash	Walnut	3/4 x 3-1/4 x 18
Case				
B1	2	Side	Plywood	3/4 x 16-1/2 x 47
B2	2	Side edging	Walnut	3/4 x 7/8 x 47
Web Frames				
C1	4	Front and back	Yellow poplar	3/4 x 2-1/2 x 41-1/2
C2	8	Stretchers	Yellow poplar	3/4 x 3 x 12
C3	2	Dividers	Plywood	3/4 x 5-3/8 x 17
C4	20	Drawer guides	Yellow poplar	1/4 x 1 x 3
C5	10	Drawer guides	Yellow poplar	1/2 x 1 x 3
C6	2	Wear strips	Maple	1/8 x 7/8 x 16-3/4
C7	4	Wear strips	Maple	1/8 x 7/8 x 16-3/4
Drawer Frames				
D1	2	Ends	Walnut	3/4 x 1-5/16 x 6-1/8
D2	1	Top	Walnut	3/4 x 3/4 x 39-1/2
D3	1	Bottom	Walnut	3/4 x 7/8 x 39-1/2
D4	2	Middles	Walnut	3/4 x 1-1/4 x 4-1/2
Back				
E	1		Plywood	1/4 x 41-1/4 x 47
Doors				
F1	4	Stiles	Walnut	3/4 x 3-9/16 x 40-3/8
F2	2	Upper rails	Walnut	3/4 x 3 x 14-3/4
F3	2	Middle rails	Walnut	3/4 x 3 x 14-3/4
F4	2	Lower rails	Walnut	3/4 x 4-3/8 x 14-3/4
F5	4	Panels	Plywood	1/4 x 14-3/4 x 15-1/2
Shelves				
G1	3	Shelves	Yellow poplar	3/4 x 16 x 40-1/4
G2	3	Front edging	Walnut	3/4 x 7/8 x 40-1/4
Bottom				
H1	1	Panel	Plywood	3/4 x 16-1/4 x 41-1/4
H2	1	Front edging	Walnut	3/4 x 7/8 x 41-1/4
H3	4	Foot mounting blocks	Plywood	3/4 x 4 x 4
H4	1	Backer	Walnut	3/4 x 1 x 42
H5	1	Front molding	Walnut	1/2 x 1 x 43
H6	2	Side molding	Walnut	1/2 x 1 x 18-1/2
H7	11	Glue blocks	Yellow poplar	3/4 x 3/4 x 4
H8	4	Feet	Maple	3-7/8-in. max. dia., 4-1/4-in. tall
H9	4	Dowels	Oak	1-in. dia. x 2-5/8-in. long
Drawers				
J1	3	Fronts	Walnut	3/4 x 4-7/16 x 12-3/8
J2	3	Backs	Yellow poplar	1/2 x 4-7/16 x 12-1/4
J3	6	Sides	Yellow poplar	1/2 x 4-7/16 x 16-5/8
J4	3	Bottoms	Plywood	1/4 x 11-7/8 x 16-1/2
J5	6	Stops	Yellow poplar	3/4 x 1/2 x 2

Hardware

Qty.	Name	Qty.	Name
3	ceramic knobs, 1-1/2-in. dia.	8	shelf supports
2	ceramic knobs, 1-in. dia.	2	continuous hinges, 39-1/2-in. long
2	magnetic catches		

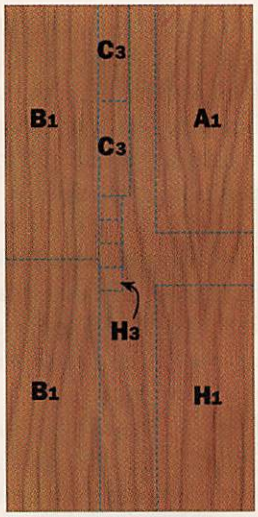
Fig. L
Plywood Cutting Diagrams

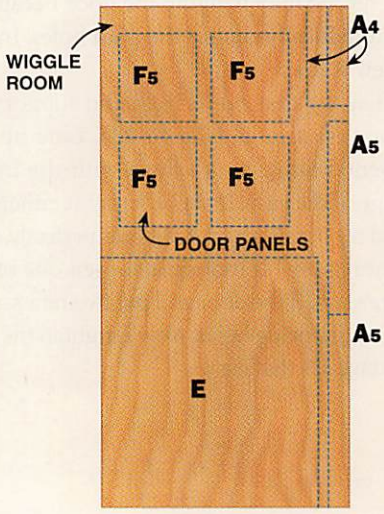
All of the pieces for this cupboard, except for the drawer bottoms, can be cut from two pieces of plywood. On the 1/4-in. sheet, position the door panels anywhere you like to get balanced and pleasing figure. You'll have plenty of room to try several options.

Table of Rough Sizes

3/4" Plywood		W x L
Top	A1	19 x 43
Bottom	H1	19 x 43
Sides	B1	18 x 48
Dividers	C3	6 x 18
Foot blocks	H3	4-1/2 x 4-1/2

1/4" Plywood		
Door panels	F5	15 x 17
Back	E	42 x 48
Top shims	A4	4 x 13
Top shims	A5	4 x 43

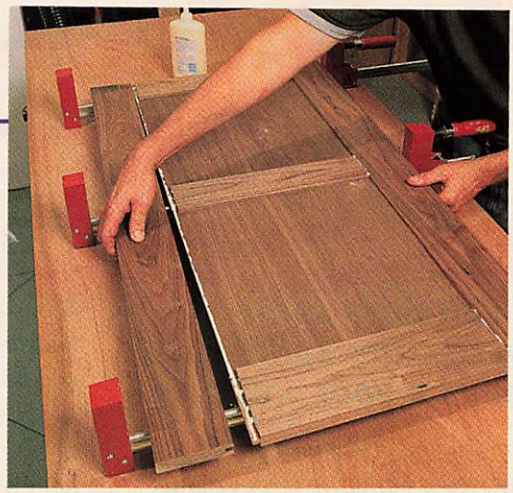




Installing Hardware and Finishing

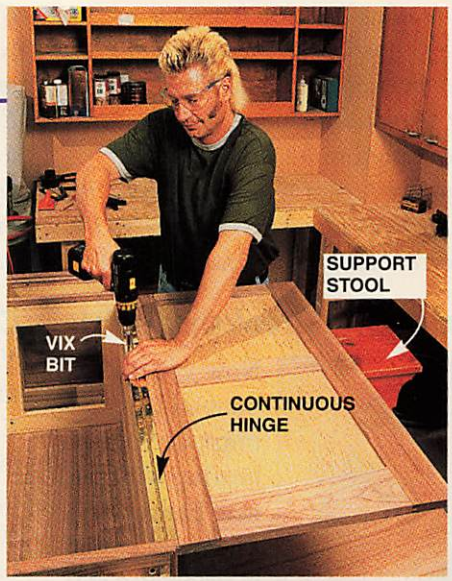
1. Drill holes for the drawer and doorknobs (Fig. F, page 60).
2. Drill holes for the shelf pins.
3. Install magnetic catches for the doors.
4. Remove the top, back and doors to make finishing easier.
5. Dye the maple feet (see Sources, page 67).
6. Walnut looks great under almost any kind of finish. We used Minwax Antique Oil to bring out the handsome figure.
7. Bright white ceramic knobs are a striking contrast to the cupboard's dark walnut (see Sources, page 67). (The original Amish cupboard that inspired ours has ceramic knobs, as well.) Install the knobs.
8. Start making jelly! AW

17



Glue the plywood panels and the rails into the door stiles. The joinery is simple tongue and groove, which is plenty strong for this large door because *all* the parts are glued together.

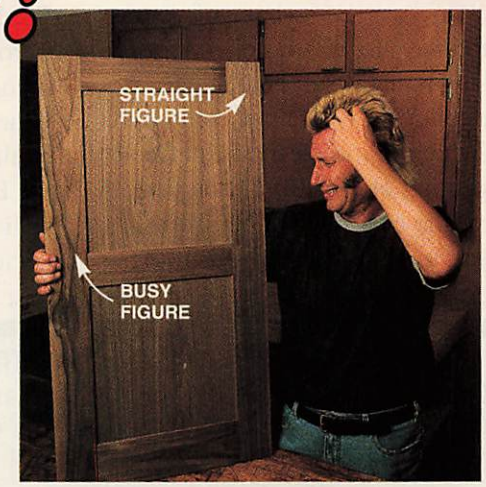
18



Hang the door with a continuous hinge. Unusual? Sure, but it's slick. It's easy to install, with no fussy mortises, just a simple rabbet; plus it's durable and rigid, which helps keep the door flat.

Oops!

I was a cheapskate, and regretted it. The first time I made the doors for this cabinet I used up the tail end of my walnut pile. The mismatched figure looked nasty! I had to buy a whole new bunch of lumber and build a new pair of doors. Lesson learned: Don't skimp when you buy lumber.



Sources

Van Dyke's Restorers
(800) 558-1234, www.vandykes.com
Maple bun legs, #CG-02003062; $11.69 each
Oak dowel rod, 1-in. dia., 36-in. long, AG-02252630; $3.29

Woodworker's Hardware
(800) 383-0130, www.wwhardware.com
Continuous hinge, brass, 1-1/2-in. wide, 48-in. long, LA11248 3; $6 each
Self-centering hinge bit (Vix bit), for #5 & #6 screws, #VB5; $5.74
Magnetic catch, A09793 PT; $1 each.

Jesada Tools
(800) 531-5559, www.jesada.com
1-in. planer bit, #652-502; $20
5/8-in. roundover bit, #638-945; $40.

Woodcraft Supply
(800) 225-1153, www.woodcraft.com
3/8-in. plug cutter, #08X85; $13
3/8-in. face-grain plugs, walnut, #17T91; $9/100
1-in. Forstner bit, #12E42; $17
Medium walnut water-soluble dye, #123823; $8.

Lee Valley
(800) 871-8158, www.leevalley.com
Ceramic knobs, 1-1/2-in. dia., #01W0403; $1.10 each, 1-in. dia., #00W7002; $ .97 each.

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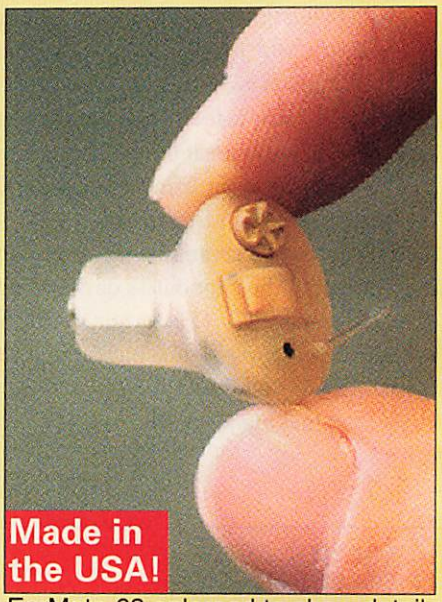
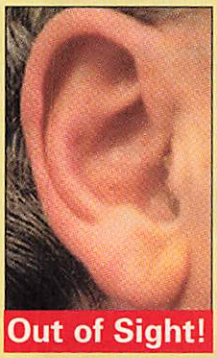


EarMate-63 enlarged to show detail.

Scientific Breakthrough!



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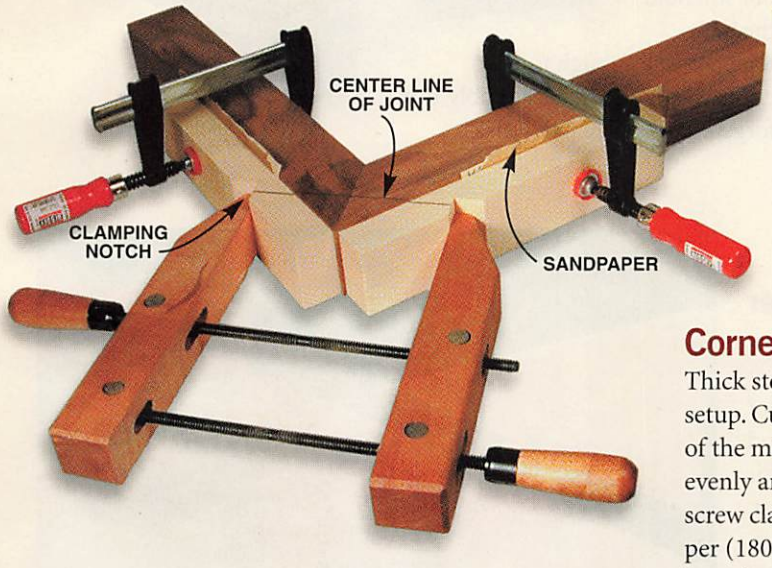
by Randy Johnson

Clamping Tips



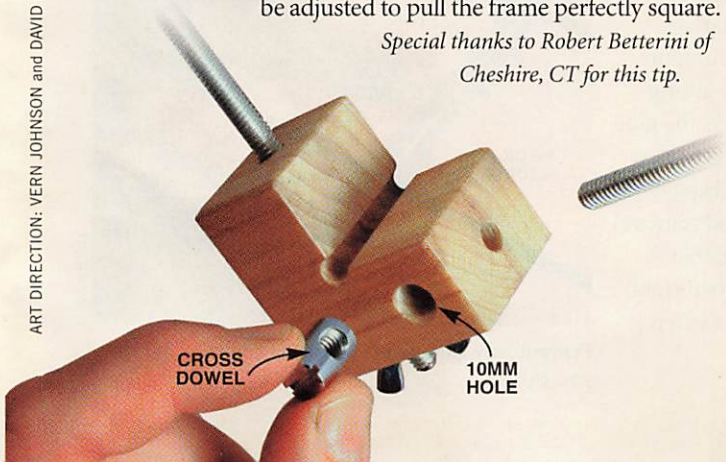
Corner Clamp for Thick Stock

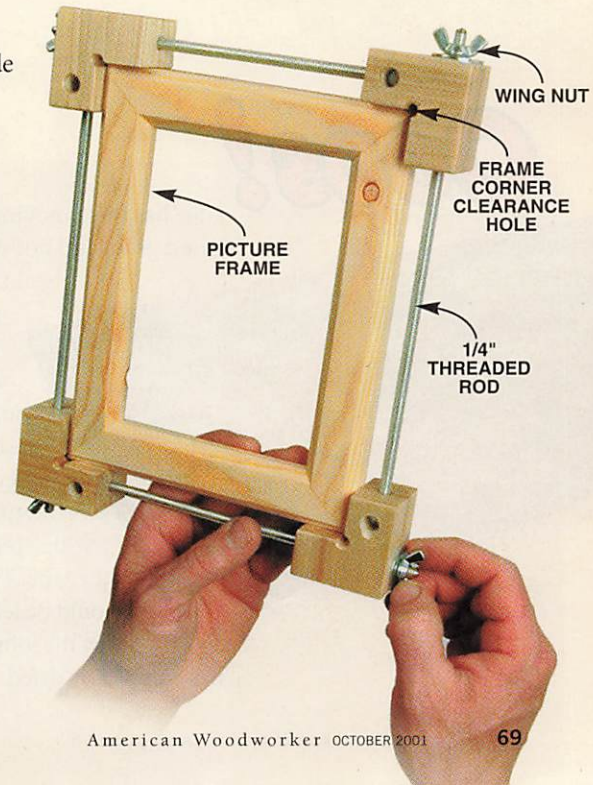
Thick stock is no problem with this quick clamping setup. Cut the notches so they line up with the center of the miter. This helps the joint come together evenly and reduces joint slippage when the hand-screw clamp is tightened. A piece of folded sandpaper (180 or 220 grit) placed between the clamping boards and workpieces also helps.

Perfect Frames Every Time

If you make a lot of small picture frames, here's an excellent shop-made clamp. Make the corner blocks from 2-in. x 2-in. x 1-1/2-in.-thick stock. Drill holes for the threaded rod and a 10mm hole for the cross dowel (available from Rockler 800-279-4441, cross dowels, #31823; $2.69 for pack of 8, 10mm drill bit, #46771; $5). The four corner blocks all have the same shape and drilling pattern. The threaded rod is held on one end by the cross dowel and by a wing nut on the other. The wing nut is used to tighten the clamp and can be adjusted to pull the frame perfectly square.

Special thanks to Robert Betterini of Cheshire, CT for this tip.

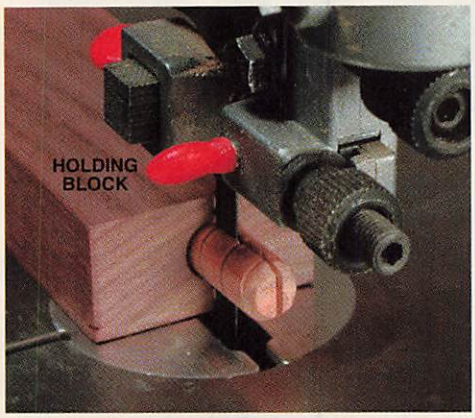




ART DIRECTION: VERN JOHNSON and DAVID FARR • PHOTOGRAPHY: STAFF, UNLESS OTHERWISE INDICATED

Split Dowels for Easier Dry Fitting

Dry fitting dowel joints can be downright aggravating. They fit so tightly, it's next to impossible to disassemble the joint. For an easy solution, use a bandsaw and a block with a hole in it to cut slots in the ends of a few dowels. These dowels are easy to insert and remove, but still hold the joint together well enough to check the fit. For final assembly, don't forget to use normal dowels!



Clamp Extender

You're in the middle of clamping up your dream entertainment center and you discover your clamps are too short. What do you do? You stay calm and get creative. Screw a wood block to the edge of your cabinet case. This gives your clamps something to pull against. Do the same on the other side of the cabinet. As for the screw holes, don't worry. They get covered with the face frame.

MIKE KRIVIT

Oops!

Glue has the annoying habit of getting into wood grain and not showing up until you stain. To avoid the disappointment of these ugly glue marks, apply tape along the joints prior to gluing and clamping. As the glue squeeze-out starts to dry and turns waxy, scrape it off with a putty knife and remove the tape. The only glue that should be left is a thin strip right along the joint. Sand it off when it has completely dried.

MIKE KRIVIT

Prevent ugly glue marks by taping the joint before you glue.

Masking Tape Miter Clamping

This is the simplest way to glue and clamp a long miter. Lay the parts mitered-side down on a flat surface. Now use masking tape as both a hinge and a clamp. Apply a couple of strips of masking tape to pull the parts close together. Add a long strip of tape for the hinge. Carefully turn the assembly over and spread some glue on the miters. Fold up one half and add some more masking tape to hold all the parts together.

Step 1 Step 2

Spacers Center Clamping Pressure

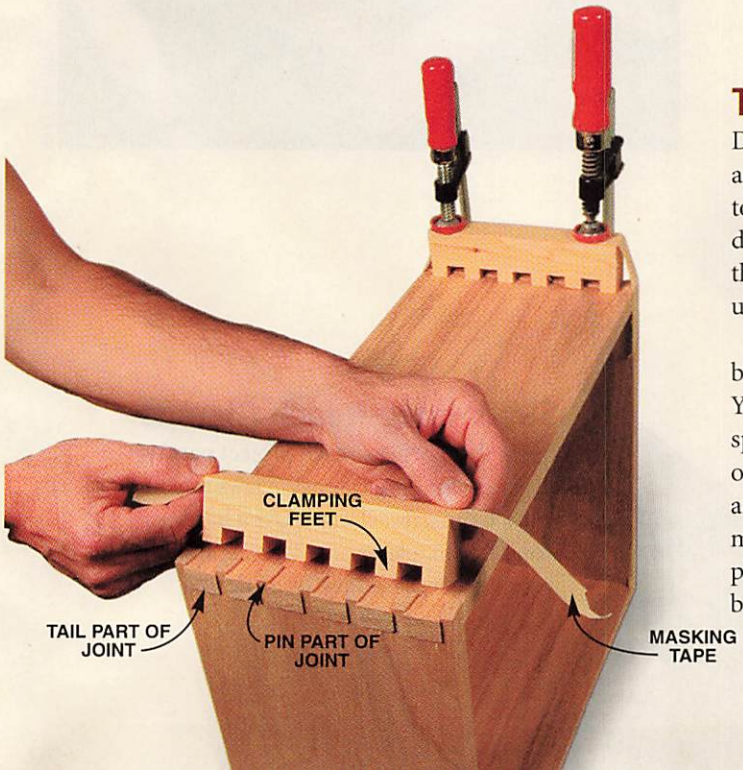
Use a couple strips of wood under your pipe clamps to put the clamp's screw directly in line with your work. This helps center the clamping force, which reduces the possibility of the boards buckling and helps keep the joints tight on both sides of the boards. For 3/4-in. stock, a 3/8-in.-thick strip of wood will work with most clamps.

MIKE KRIVIT

Trouble-Free Dovetail Clamp

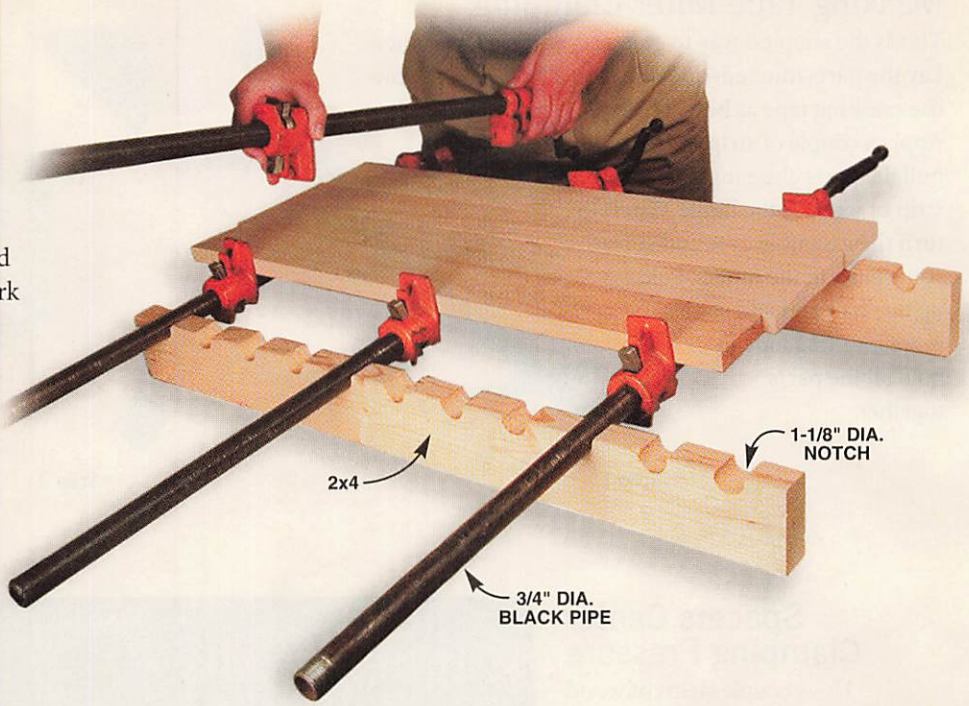
Dovetails are popular because they're strong and self-locking from one side. But you need to clamp the other side with the pressure directly over the joint, if possible. And when the dovetails protrude a bit, that's tough. This unique clamping block solves the problem.

You can make one of these blocks with a bandsaw or a dado blade on your tablesaw. You want the feet of the clamping block to be spaced and sized so they fit between the pins of the joint. For assembly, tap the box together and position the clamping blocks. A little masking tape works wonders to hold them in place while the clamps are added. Check your box for squareness and let it dry.



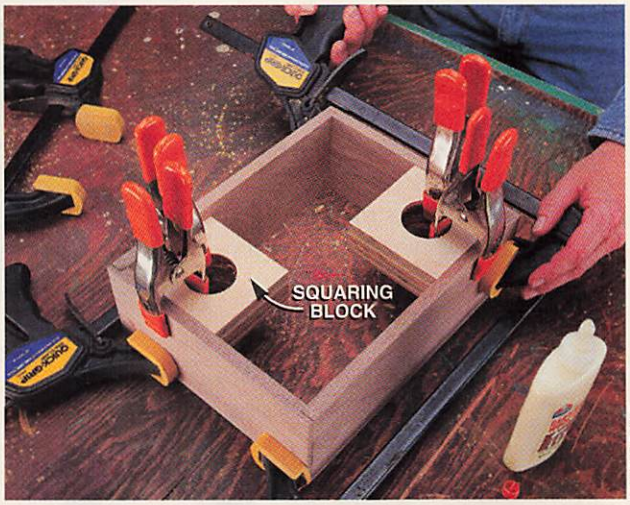
Quick Clamp Stands

These clamp stands are quick to make, set up and store away. Plus, they work great. Make them out of 2x4s and use a 1-1/8 in. Forstner bit for the notches. These stands keep your pipe clamps from tipping and there's plenty of clearance for turning the cranks.



Squaring Blocks for Precise Corners

Here's a surefire way to keep drawers and boxes square during clamping. Cut some perfectly square blocks of solid wood (or glued-up layers of plywood) about 4-in. square by 1-1/2-in. thick. Drill a 2-in. hole in the middle of each block with a holesaw. Use spring clamps to hold the squaring blocks in place. Add bar clamps and leave the squaring blocks in place until the glue is set.



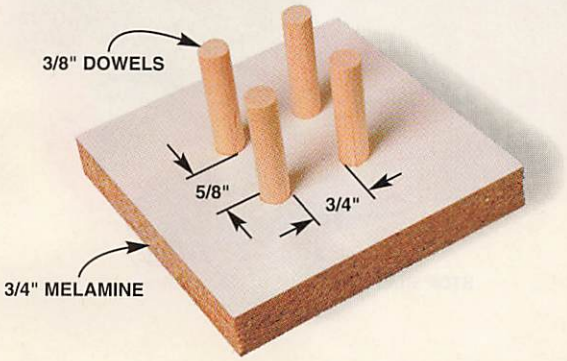
MIKE KRIVIT

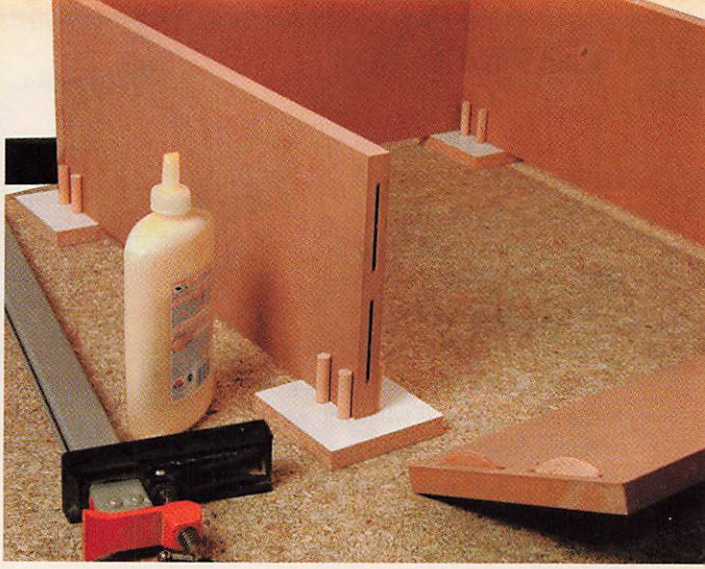
Super-Long-Reach Clamps

Get at that hard-to-reach project part by adding some long extension jaws to your wood handscrew clamps. Use a hard wood like maple or oak. These species work best because they resist flexing.

Parts Stands for Easier Biscuit Assembly

Biscuit joinery is great, but without an octopus for a shop assistant, how do you hold all the parts? These simple little stands can help. Made of 3/4-in. melamine and some 3/8-in. dowels, they hold your parts and allow you to easily add the clamps. The dowel spacing allows for either 3/4-in. or 5/8-in. material. As a bonus, the glue won't stick to the melamine.

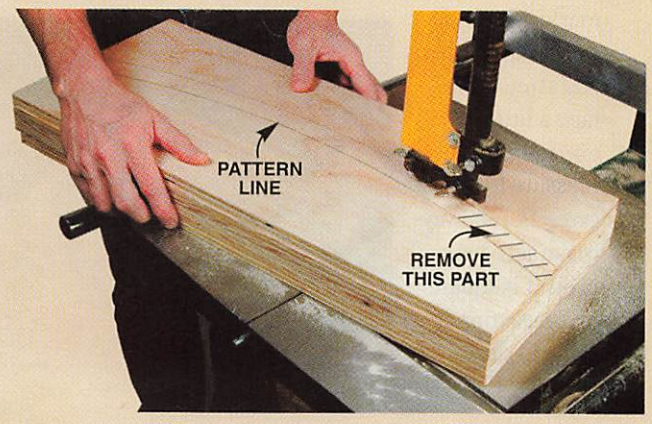


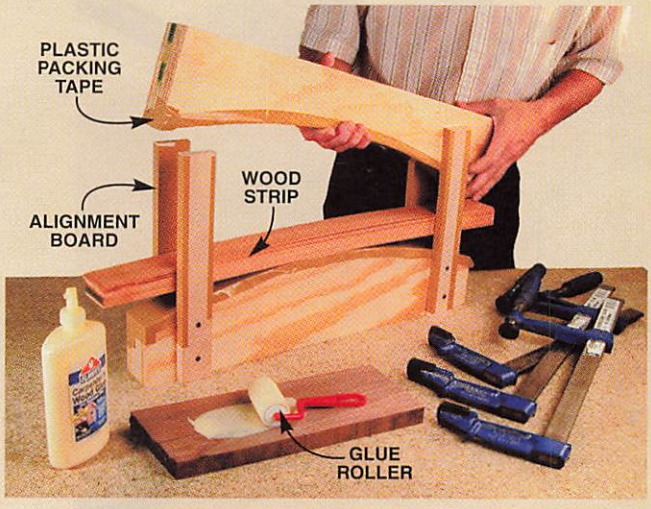


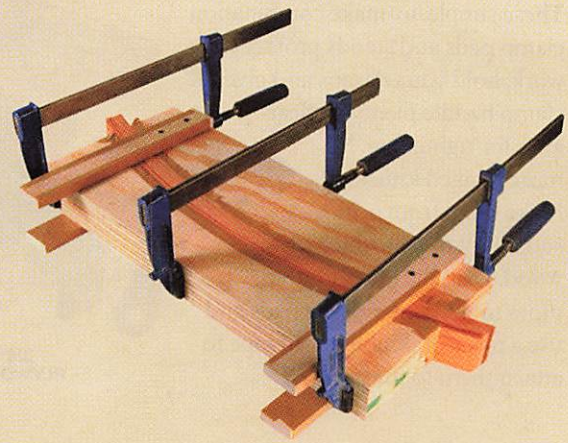
A Press to Laminate Curved Parts

Curved, laminated parts are stronger than parts sawn from solid wood. This press makes laminating easy. The press is made of layers of plywood or particleboard that are glued together. This sandwich is cut into two parts on the bandsaw. The alignment boards (which keep the press and the wood strips lined up) are screwed onto one half. During clamping, some glue squeeze out will occur, so apply plastic packing tape to the clamping press and alignment boards to keep them from sticking to each other and your workpiece.

The strips of wood should be milled to between 1/16-in. and 1/8-in. thick. (Sawing them to thickness on a tablesaw works, but planing them to thickness will produce a better glue joint.) Apply glue evenly to the strips. A small paint roller works great for this. Then place your parts in the press and clamp. Leave the clamps on for at least eight hours. Now you've got a board that's both curved and strong.

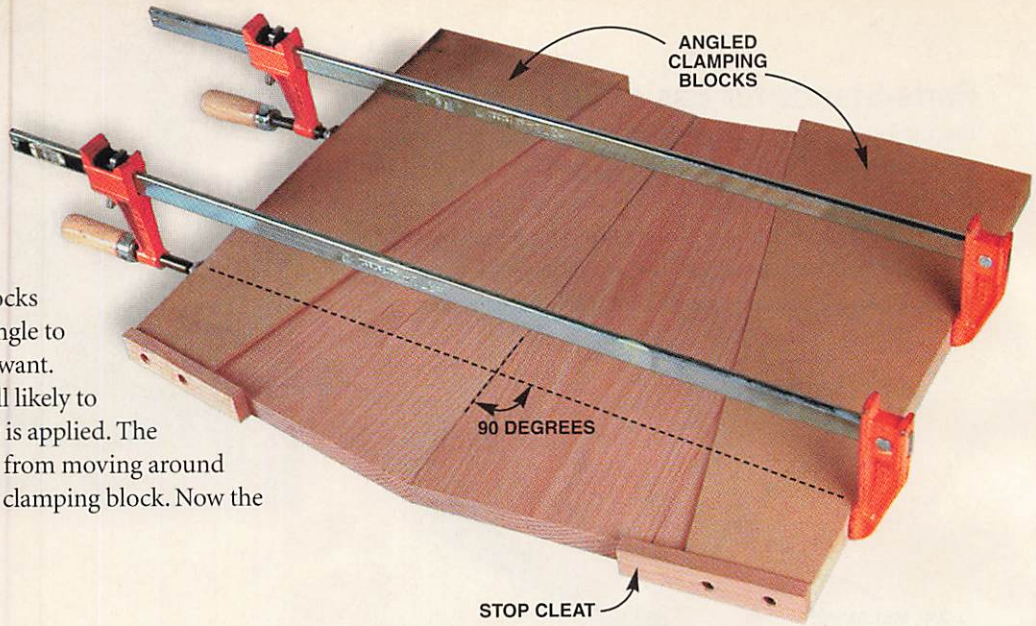






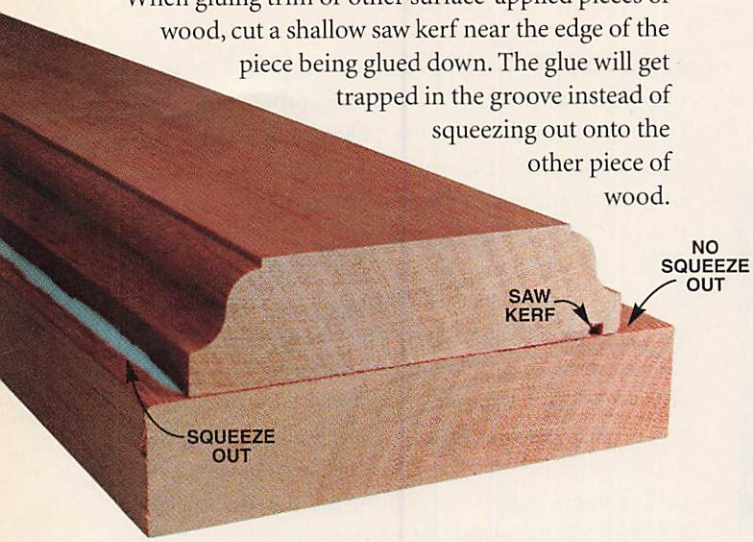
No-Slip Taper Clamps

Every woodworker eventually comes across an angled or tapered clamping task. Wedge-shaped clamping blocks place the clamps at a right angle to the joint, which is what you want. But the wedged parts are still likely to slip and slide when pressure is applied. The real secret to keeping things from moving around is to add a stop cleat to each clamping block. Now the parts will stay put.



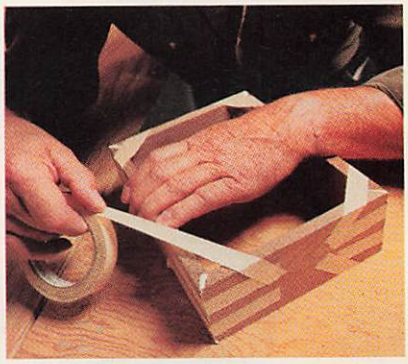
Saw Kerf Stops Glue Squeeze-Out

When gluing trim or other surface-applied pieces of wood, cut a shallow saw kerf near the edge of the piece being glued down. The glue will get trapped in the groove instead of squeezing out onto the other piece of wood.



Clamps by the Roll

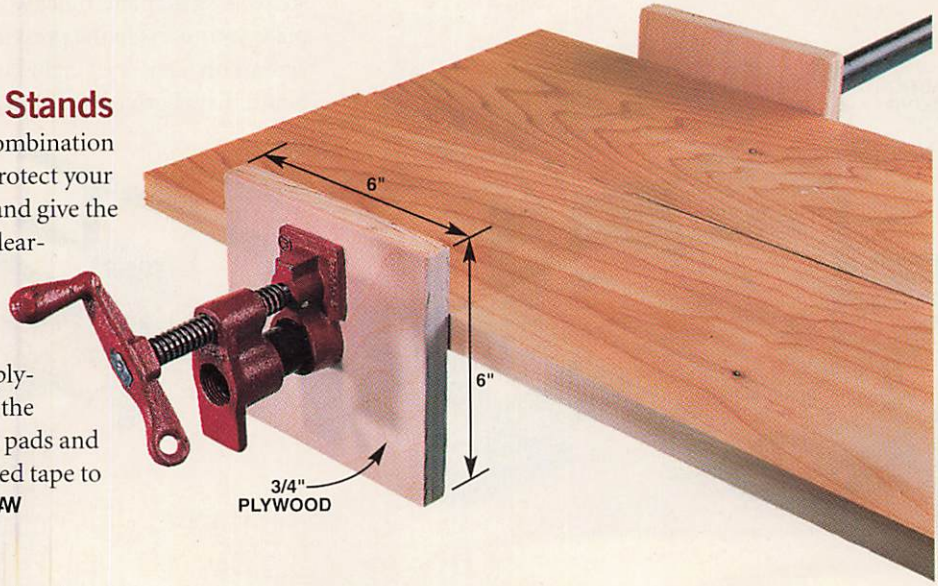
Tape works wonders when it comes to clamping together small projects like jewelry boxes. Regular clamps can be cumbersome and simply too big and heavy. By contrast, masking tape, is easy to use. When you stretch the tape a little it exerts sufficient pressure for small projects. As always, make sure your project is square before setting it aside to dry.



BILL ZUEHLKE

Pipe Clamp Pad Stands

These simple-to-make combination clamp pads and stands protect your work, hold your clamps and give the clamp handle plenty of clearance for tightening. No more banged knuckles! Make them from 6-in. squares of 3/4-in.-thick plywood. Drill the holes for the pipes in the center of the pads and use a piece of double-faced tape to attach them to the jaws. *AW*



MIKE KRIVIT

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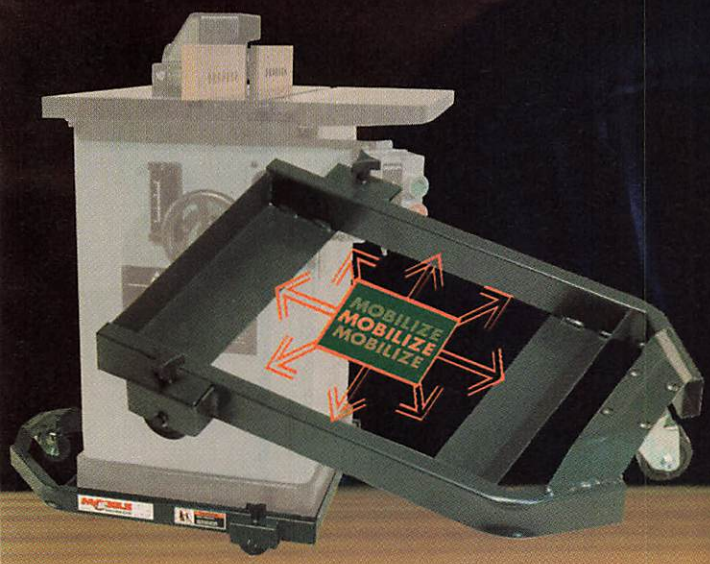

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TOOL TEST •

Sharpening Machines

Are they better than a grinder and stones?

By Tom Caspar

I know a guy who uses a belt sander to sharpen his hand tools! Don't laugh, it works—sort of. There are dozens of setups you can use to sharpen tools. Many woodworkers have grown accustomed to using a high-speed grinder and stones, but a grinder can burn your tools and stones are a hassle. Wouldn't you like a single, foolproof machine that could do it all?

The Test

We took a hard look at horizontal and vertical sharpening machines to see if they fit the bill. With the aid of a panel of intermediate-skill, non-professional woodworkers, we rated the machines on how well they performed four basic tasks:

1. Lapping

You only have to do it once, but it's gotta be done right. Lapping makes the back of a tool dead flat and highly polished (Photo 1). You must remove all of the factory-made milling marks about 1 in. back from the tip. This tedious and exacting process is a bear when done by hand. If you can get a machine to help, by all means, go for it.

2. Coarse grinding

You won't need to do it very often, but coarse grinding is essential for restoring old and abused tools. It removes a lot of metal to form an approximate bevel (Photo 2). You don't need to precisely calibrate the grinding angle, but an easily adjustable, wide tool rest offers the most control.

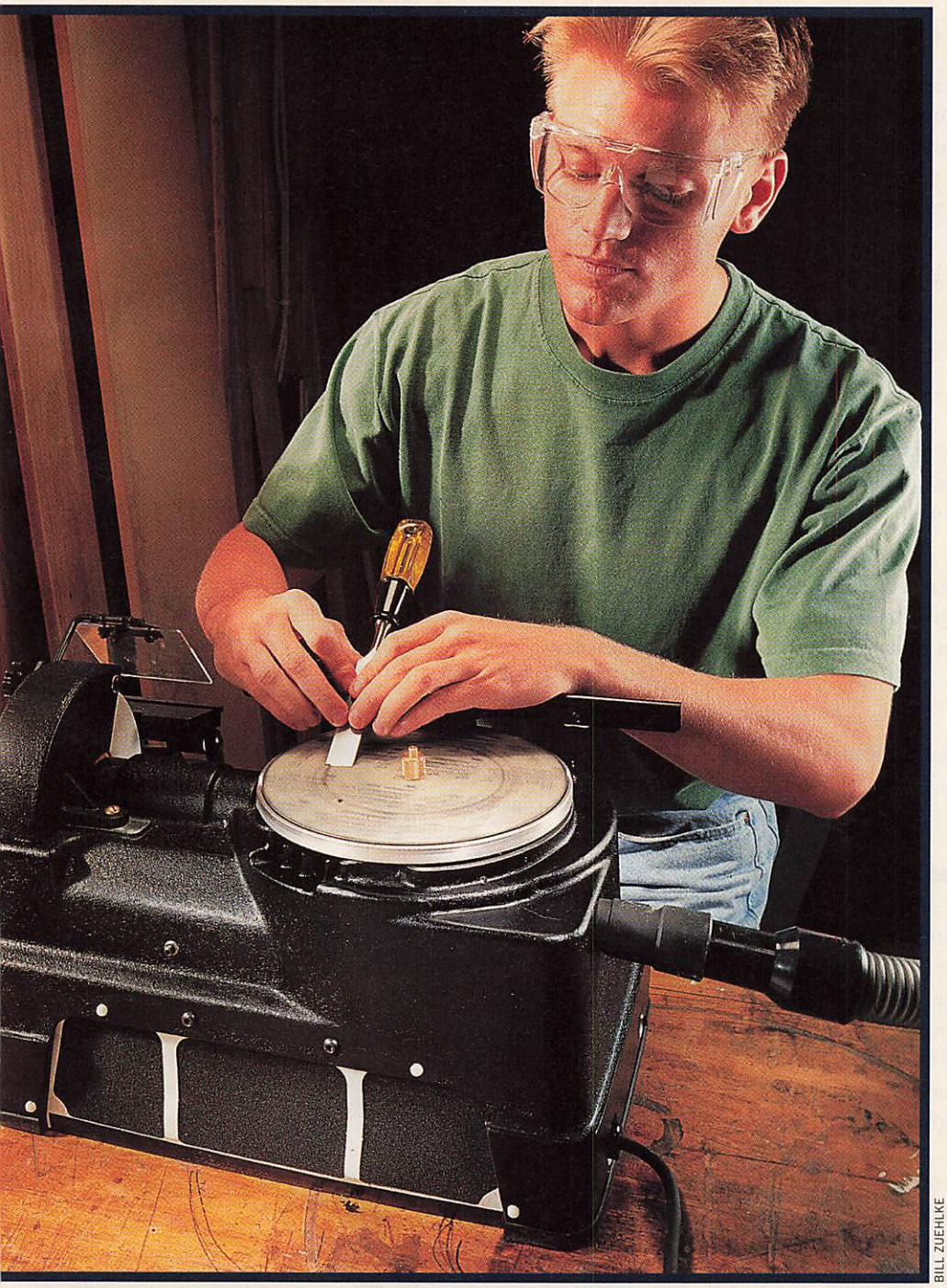
3. Medium grinding

You'll renew the bevel made in this operation quite often (Photo 3). At this point, grinding becomes fussier. The bevel you produce should be absolutely straight across and accurately angled to within a few degrees. This makes honing much easier. Machines with good tool rests and jigs are easiest to use, although you can get decent results without a jig if you have a steady hand.

4. Honing

The faster this goes the better, because you'll be honing over and over again. You refine the tip of the tool until it's razor sharp at a single precise angle (Photo 4). Three things are critical: controlling the angle of the bevel, defining the shape of the edge (dead straight or, in the case of some plane blades, very slightly curved) and producing a mirror-smooth polish. Machines that can do all three things well have a good tool rest, a good jig and fine abrasives.

ART DIRECTION: PATRICK HUNTER • PHOTOGRAPHY: STAFF, UNLESS OTHERWISE INDICATED



BILL ZUEHLKE

The Acid Test

Can each machine perform all the basics?

1

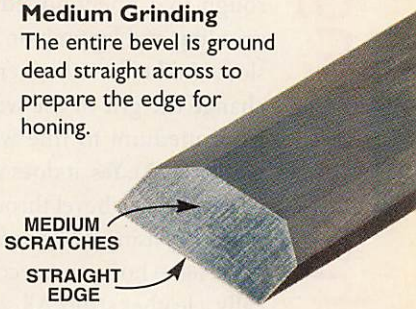
Lapping
The back of every new tool must be accurately flattened and highly polished.

2

Coarse Grinding
Removing nicks or dings to shape a new bevel requires hogging off a lot of steel.

3

Medium Grinding
The entire bevel is ground dead straight across to prepare the edge for honing.



4

Honing
The tip is highly polished at a precise, steeper angle.

Planer and Jointer Knife Grinding

In addition to sharpening hand tools, you can renew the edges of planer and jointer knives on some sharpening machines. They should offer both coarse and medium grinding because you'll have to remove a lot of steel to get past deep nicks. Good machines have easily calibrated adjustments, well-machined jigs and clear instructions.

Wouldn't you like one machine that could do it all?

Vertical-Wheel Machines

Three vertical machines are very similar in design. A fourth, the Tormek, is much more sophisticated. Here's how the three basic machines performed as a class. For details on individual machines, see the chart on pages 80 and 81.

Lapping

Barely acceptable. Using the side of the large wheel, it's a slow operation yielding imperfect results. Maintaining the side of the wheel as a flat surface is difficult.

Coarse grinding

Okay. Use the dry wheel, but upgrade the tool rest (see Sources, page 80). The standard tool rest is too small and difficult to adjust. Toss it.

Medium grinding

Pretty good. You can't overheat an edge on the wet wheel, but you might have trouble making the edge straight without a jig (see Recommended Accessory, at right).

Honing

Forget it. The wet wheels are too coarse to produce a polished edge, so you'll still be honing with stones or sandpaper.

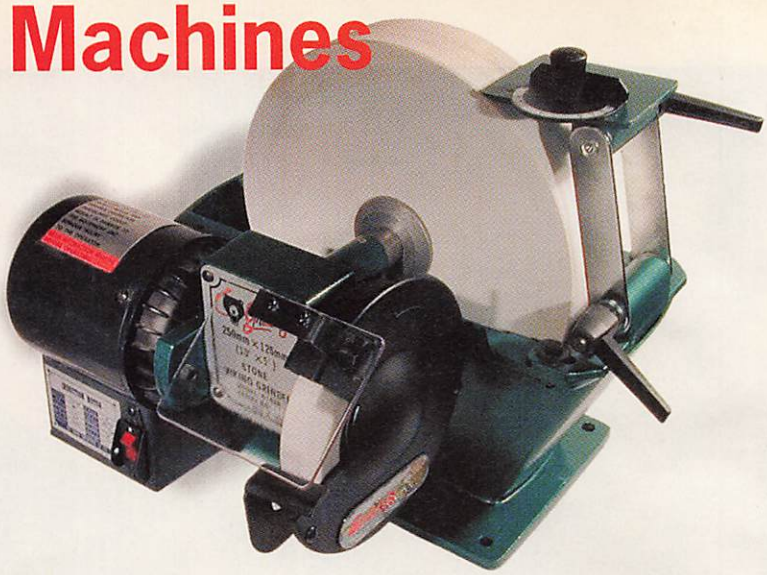
The Tormek

A favorite with hand tool users for years, the Tormek is a complete sharpening system at a fairly steep price ($390). You can go all the way from a rough to a finely honed edge, although coarse grinding and lapping on the wet wheel are fairly slow. Unlike the other vertical machines, you can change the grit of the wet wheel back and forth from medium to fine with an accessory stone grader ($22). Yes, it does work.

Renewing a bevel through medium grinding is quite easy using the Tormek's sliding jig. You use the same jig to hone on a second wheel, which is basically a leather strop. All strops round over edges a bit, but if you've got the angles worked out and you don't overdo it, you'll get a razor-sharp tool.

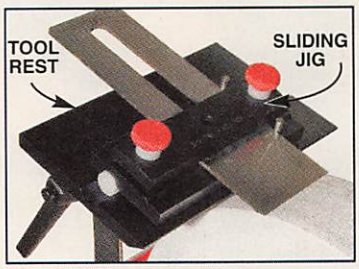
The Bottom Line

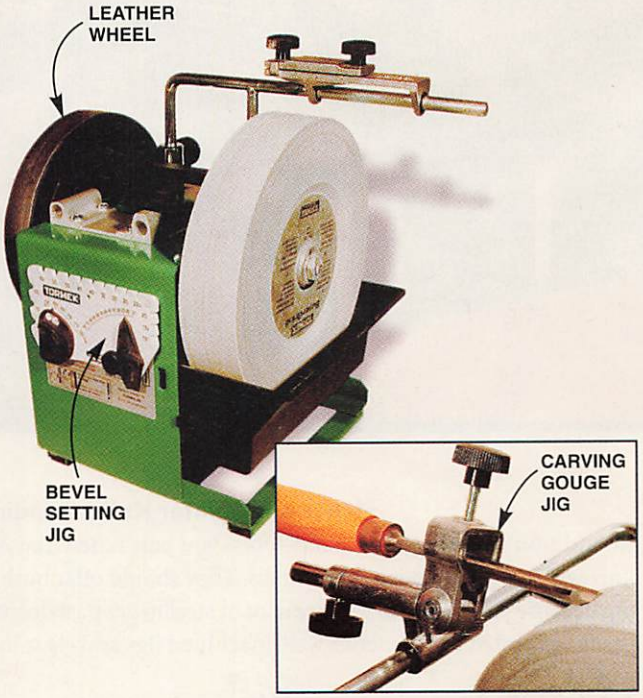
Vertical-wheel sharpening machines are by no means complete systems. The basic vertical machines are best at preparing an edge for honing. Stick to the wet wheel, and you'll never burn an edge. They're a reasonable substitute for a high-speed grinder and a coarse stone, but aside from the Tormek, not a substitute for fine stones.



Vertical sharpening machines have both a slow-speed, coarse-grit wet wheel and a high-speed grinder.

Recommended Accessory
You'll make straighter edges on any vertical machine by adding an Accusharp tool rest and grinding jig ($33 to $40, see Sources, page 80).





The Tormek features two slow-speed wheels: a wet one for grinding and a leather one for honing. There's a well-designed jig available for just about every woodworking tool ($13 to $60 each).

Horizontal-Wheel Machines

Most of these machines are very simple: water drips from a reservoir on a rotating 1,000-grit waterstone. Reliant and Delta offer an additional high-speed grinder. The Veritas, however, is a dry, sandpaper-based system. Here's how the wet machines performed as a class. For details on individual machines, see the chart on pages 80 and 81.

Lapping

Acceptable. Use the surface of the large wheel, either while it's spinning or stationary. You'll get a higher polish than a vertical-wheel machine produces, but it's still not shiny enough.

Coarse grinding

Okay, but only possible on the two machines with a high-speed grinder. Upgrade their tool rests (see Sources, page 80) and you'll be much better off.

Medium grinding

Good. The wet wheels work fine, but the standard tool rests on the single-wheel machines are too narrow and not equipped with jigs. It takes practice to make a consistent bevel. Delta's jig works well. Some machines offer auxiliary tool rests for planer knives that are wider and accept a neat aftermarket jig (see Recommended Accessory, at right).

Honing

Acceptable, using the same wet wheel. Your tools will be sharp enough for general-purpose work, but you'll have to finish with stones or sandpaper for truly keen edges.

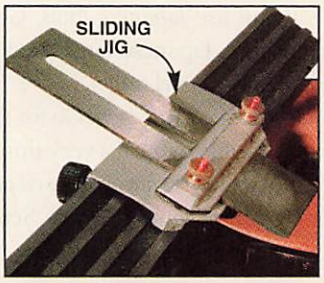
Veritas Power Sharpening System

The Veritas is quick and clean, but this convenience comes at a pretty stiff price ($395). Clamp your tool in a jig, set the tool rest into one of seven pre-marked indents to establish the bevel angle and you're all set. Changing grits by swapping discs only takes a few seconds. The honing disc is thinner than the coarser ones, so when you switch to the finest disc, you automatically raise the bevel angle by one degree. Now you can form a perfect, shiny bevel on the tip of your tool. This is a dry system, so you won't make a wet mess. Hook up a vacuum to keep your shop free of grinding dust.

The Bottom Line

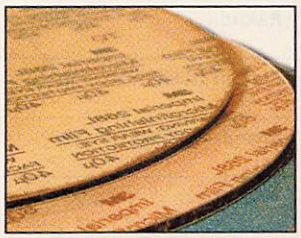
Horizontal wheels are finer than vertical wheels, so you get a sharper edge. A horizontal machine is a good substitute for a high-speed grinder and medium stones. The Makita (with accessories) and Veritas can replace your fine stones, as well.

Horizontal machines have slow-speed, medium-grit wet wheels. The Delta and Reliant come with additional high-speed grinders.



Recommended Accessory Make super-sharp edges on the Makita, Delta and Reliant with a 2 In 1 guide ($15, see Sources, page 80). Grind your edge on the machine's fine wheel, then add a roller to the 2 In 1 guide and continue honing on your favorite fine and superfine stones.

The Veritas Power Sharpening System is a completely dry machine. You can easily interchange a full range of self-stick sandpaper discs, good for up to 200 sharpenings apiece ($3 to $5 each).



Recommendations

If you don't mind getting a bit wet, most sharpening machines are good replacements for high-speed grinders. But only a few machines can replace all your stones, and they cost almost $400.

What Will Work for You?

• *If you've got a high-speed grinder and hate overheating your edges.* You're in the market for any wet machine. It's impossible to burn an edge with one.

• *If you don't have a grinder.* Look for a sharpening machine that has one, but count on upgrading the tool rest.

• *If you don't sharpen often or need a super edge.* Look at the least expensive horizontal-wheel machines.

• *If you prefer honing on a stone without a jig.* Pick a vertical-wheel machine. It creates a hollow-ground bevel which is easy to balance on a stone.

• *If you use Japanese tools.* Go with a horizontal-wheel machine. Japanese laminated blades should be ground with a flat bevel only.

• *If you use carving tools.* Go for the wet Tormek and its jigs. It's possible to burn a very thin edge on the dry Veritas.

• *If you want to sharpen nicked planer and jointer knives.* You better have some patience. Setting up the jig and removing a lot of steel takes time.

Do You Need One At All?

Not really. Here's a complete, low-cost alternative sharpening system:

Lapping

A piece of 1/4-in. plate glass, sandpaper and a low-tack spray adhesive. Cost: about $10.

Coarse and Medium Grinding

A slow-speed grinder with white wheels, an aftermarket tool rest and a diamond dresser. Cost: about $155.

Honing

A combination 1,000/6,000 waterstone and a honing jig. Cost: about $40.

Sources

Accusharp tool rests, grinding jigs and wheel-dressing kits to fit Delta, Reliant and Grizzly grinders are available through Penn State Industries, (800) 377-7297, www.pennstateind.com

2 In 1 honing jig, #02.26.01; $15 is available through Highland Hardware, (800) 241-6748, www.highlandhardware.com

Veritas Tool Rest, #05M23.01; $33 and the Veritas Grinding Jig, #05M06.01; $16 are available through Lee Valley Tools, (800) 871-8158, www.leevalley.com

Sharpening Machines

	Tool	Price	Wheel Grit	Lapping Overall	COARSE GRINDING Overall	Wheel Speed	Tool Rest	MEDIUM GRINDING Overall	Tool Rest	Type Of Jig
Vertical Wheel	Delta 23-700	$160	Medium	Fair	Fair	Fast	Fair	Good	Good	Sliding miter gauge
Vertical Wheel	Grizzly G1036	$130	Medium	Fair	Fair	Fast	Fair	Good	Fair	Fixed miter gauge
Vertical Wheel	Penn State Viking Grinder	$130	Medium	Fair	Fair	Fast	Fair	Good	Fair	NA
Vertical Wheel	Tormek	$390	Medium, fine and superfine strop	Fair	Good	Slow^	Excellent	Excellent	Excellent	Sliding clamp
Horizontal Wheel	Craftsman 21171	$80	Fine	Fair	NA	NA	NA	Fair	Fair	NA
Horizontal Wheel	Delta 23-710 BEST BUY	$160	Fine	Fair	Fair	Fast	Fair	Good	Good	Sliding clamp
Horizontal Wheel	Makita 98202 BEST BUY	$260	Fine	Good*	NA	NA	NA	Good	Good	NA
Horizontal Wheel	Rakuda	$495	Fine	Fair	NA	NA	NA	Good	Good	NA
Horizontal Wheel	Reliant DD68	$100	Fine	Fair	Fair	Fast	Fair	Fair	Fair	Sliding miter gauge
Horizontal Wheel	Woodtek 958-371	$90	Fine	Fair	NA	NA	NA	Fair	Fair	NA
Horizontal Wheel	Veritas EDITORS' CHOICE	$395	Coarse to superfine	Excellent	Excellent	Slow^	Excellent	Excellent	Excellent	Sliding clamp

NA = Not Appropriate † = Standard equipment * = With accessory superfine wheel ($50), using jig ^ = Wheel not provided

Veritas Power Sharpening System; $395. Wow! It does it all. Combining dry sandpaper technology and innovative design, this user-friendly machine easily tops the field.

Delta 23-710; $160. Equipped with a good jig for chisels and plane blades, this machine is great for coarse and medium grinding, but you must further hone by hand for a really sharp edge.

Makita 98202; $260. A good machine with great accessories. Comes with a jig for planer and jointer knives. If you've already got a grinder, buy this and you'll have a complete sharpening system. *AW*

HONING	ACCESSORIES			
Overall	Planer/ Jointer Knife Jig	Other	Comments	Contact
NA	No	Accusharp jigs	Tool rest on high-speed dry grinder is awkward to adjust. Reservoir must be drained regularly.	(800) 438-2486
NA	No	Tool rest with sliding miter gauge, Accusharp jigs	Same as above. Miter gauge will not accept plane blades.	(800) 523-4777
NA	No	Accusharp jigs	Tool rest on high-speed dry grinder is awkward to adjust. Reservoir must be drained regularly.	(800) 377-7297
Excellent	Yes, Excellent	Superfine wet wheel ◊, stone grader, jigs for most hand tools, profiled leather wheel	Runner-up to Editors' Choice. Excellent manual and video come with machine. Coarse grinding is very slow. Water may collect under machine.	(800) 586-7635
Fair	No	None	Most testers had difficulty maintaining a straight edge without a jig.	(800) 377-7414
Good	Yes, good	None	Excellent hand tool jig. Planer, jointer knives may be coarse ground on extra-wide, dry wheel.	(800) 438-2486
Excellent*	Yes†, good	Coarse, superfine regular wheels, coarse green wheel for carbide knives	Best results with planer/jointer tool rest and accessory jig. Planer/jointer jig comes with basic machine.	(800) 462-5482
Fair	No	None	Most testers had difficulty maintaining a straight edge without a jig.	(800) 537-7820
Fair	Yes, fair	Coarse green wheel for carbide knives, fine wheel	Miter gauge sticks in tool rest. Accessory tool rest for knife jig accepts 2 In 1 honing guide.	(800) 767-9999
Fair	No	Medium wheel	Most testers had difficulty maintaining a straight edge without a jig.	(800) 645-9292
Excellent	No	Strip sander, three-jaw chuck for sanding drums	Dry system. Excellent manual. Can coarse grind with standard jig and flat disc. Easy-to-set bevel angles. Good grinding dust collection.	(800) 871-8158

◊ = $160 at Woodcraft Supply, (800) 535-4486

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Quickly convert low-cost lumber into valuable finished stock. Knives are driven by a powerful 2 HP motor at 11 ft./min. feed rate. Electric brake. A fine unit for giving your projects a professional finish.

Motor: 2 HP, 220V, 6.5 amps; No load speed: 3580 RPM; Feed rate: 11 FPM; Wheel depth adjustment: 3/16" to 7-5/8"; Max. width of stock: 16"; Max. depth of cut: 3/16"; Table: 23-3/4" x 17-1/16"

~~$599.99~~ $499.99
ITEM 39775-3SUA

2 PC. 16" WOOD PLANER BLADES
ITEM 43371-0SUA $19.99

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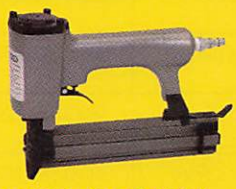


18 AND 19 GAUGE AIR FINISH NAILER

Excellent balance and 2-1/2 lb. weight make this brad tacker easy to use in tight spots. With a loading capacity of 105-18 gauge brads, you get more done with less down time. Using brads from 5/8" to 1-3/16", it will perform a variety of demanding tasks, from picture frames to homemade furniture.

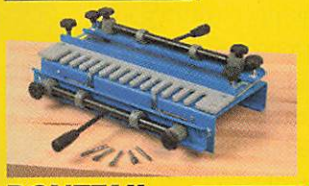
- Air consumption: 3.5 CFM at 75 PSI
- Uses 18 and 19 gauge brads
- 1/4" NPT inlet

~~$39.99~~ $19.99
ITEM 36618-1SUA

18 GAUGE BRADS PACK OF 5000

LENGTH	ITEM	PRICE
1"	33206-0SUA	$6.99
1-3/16"	33207-0SUA	$7.99
1-9/16"	33208-0SUA	$7.99

CENTRAL MACHINERY



DOVETAIL MACHINE

LIMITED QUANTITIES

Just place stock and pull cam handles to lock material in place. Both male and female dovetail cuts are made at the same time, giving you reliable dovetail joints. Allows cutting tails, pins, half blind, and standard dovetails. Accepts stock up to 12" wide. Includes bonus package of five different router bits.

~~$45.99~~ $35.99
ITEM 42821-3SUA

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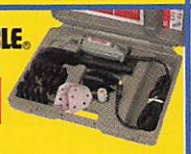

LIMITED QUANTITIES

PROFILE SANDER KIT

New design includes attachments for any sanding job! Even projects that could only be done by hand are accomplished with this unit. Sand corners, curves, angles, and an entire roll top desk. Flutes, decorative picture frames, grooves, score lines, shutter slats.

- 1.8 amps @ 120V; 6000 SPM

Includes dust pick-up pad (for hook & loop paper), dust wand, regular and offset sanding profile mounting attachments, six each of convex and concave radius profiles, five degree angle profiles, and an assortment of sandpaper all packed in a blow mold case. Factory reconditioned, factory perfect.

~~$59.99~~ $54.99
ITEM 51660-8SUA

CHICAGO Electric Power Tools INDUSTRIAL

INDUSTRIAL DUTY RECIPROCATING SAW

- 7 peak amps • 0-2400 SPM
- All ball bearing motor • Gear driven
- 1-1/8" stroke

Includes 2 blades: 6" 10 TPI bi-metal and 4" 26 TPI steel

$49.99
ITEM 42597-3SUA

RECIPROCATING SAW BLADES (15 PC.)

- (5) 24 TPI metal cutting, (5) 10 TPI and (5) 7 TPI wood cutting
- Universal 1/2" shank

$6.99
ITEM 53641-5SUA

CENTRAL MACHINERY

6" INDUSTRIAL RABBETING JOINTER

- Rabbet cut: 3/8"
- Knives: 3
- Motor: 1 HP, 110V, 8 amp
- Cutter head speed: 4600 RPM
- Infeed table size: 22-1/2"
- Outfeed table size: 19-1/2"
- Dimensions: 37-1/2" x 16" x 26-3/4"
- Cutter head size: 3"
- Rabbeting ledge: 2-7/8"
- Weight: 160 lbs.

Cast iron infeed/outfeed tables; Rack and pinion hand controls; Cast iron fence tilts 45° left/right with 45° and 90° positive stops. Includes stand

~~$269.99~~ $219.99
ITEM 30289-9SUA

REPLACEMENT BLADE SET
ITEM 38268-0SUA $9.99

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- Includes: 2 batteries, Phillips/slotted bit, charger, flashlight, and carrying case
- Factory reconditioned, factory perfect

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CHICAGO Electric Power Tools

TRIM ROUTER

Now you can tackle those jobs that were too fine or exacting for a standard router. This compact router weighs only 4 lbs. for easy operation. Includes a straight and adjusting conductor to assist in trimming and engraving in both straight and circular patterns.

- 1/4" collet • 4 lbs. tool weight
- 8-1/2" overall length
- 110V, 3-1/4 maximum amp draw
- 30,000 RPM no load speed

~~$45.99~~ $22.99
ITEM 33833-0SUA

CENTRAL MACHINERY

4" x 36" BELT/ 6" DISC SANDER

Adjustable belt sands inside and outside curves. Cast aluminum sanding disc features a cast aluminum table that locks in any angle from 0° to 45°. Table can be repositioned for use with belt or disc.

Includes: 7-1/2" x 5" cast aluminum table, miter gauge, and adjustable backstop

- 4000 FPM belt speed
- 1/3 HP, 1725 RPM, 115V, single phase
- 1725 RPM disc speed

~~$79.99~~ $59.99
ITEM 05154-6SUA

SANDING BELT CLEANER

- Increase the life of your sanding belts and discs up to 500%
- 8-1/2" x 1-1/2" x 1-1/2"

$3.99
ITEM 30766-0SUA

CENTRAL PNEUMATIC

2 HP, 5 GALLON, 115 PSI TWIN TANK AIR COMPRESSOR

Motor: 115V, 1720 RPM; CFM: 3.8 CFM @ 90 PSI, 4.5 CFM @ 70 PSI, 5.0 CFM @ 40 PSI; Air inlet: 1/4" NPT

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12" BENCH DRILL PRESS

Pivoting motor mount helps maintain correct belt tension and facilitate speed changes. Tilting table with side ledges and slots for fast clamping. Rack and pinion table raising/lowering mechanism.

- 5 spindle speeds (620, 1100, 1720, 2340, 3100 RPM)
- Motor: 1/3 HP, 115V, single phase
- Table size: 8-1/2" x 9-7/8"
- Chuck size: 1/2"
- Chuck to table or base: 14-1/8"
- Factory reconditioned, factory perfect
- Net weight: 71 lbs.

~~$157.99~~ $129.99

ITEM 06121-2SUA

CHICAGO Electric Power Tools

10" COMPOUND SLIDE MITER SAW

Comes with hold-down clamp, 60T C2 carbide-tipped blade, arbor wrench, dust bag, and spare brushes. Positive stops at 0°, 22-1/2°, and 45° left and right. Powerful motor: 1-3/4 HP,110V, 60 Hz, single phase, 11 amps; 4000 RPM; cutting capacity @ 90°: 3-1/2" deep x 12"W; arbor: 5/8"

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ITEM 41168-4SUA

CARBTIP INDUSTRIAL COMBINATION SAW BLADES

Alternate top bevel, C2 tungsten carbide tips; Heat-treated high carbon steel body.

DESRIPTION	ITEM	PRICE
10" x 60 Tooth	38543-3SUA	$13.99
10" x 80 Tooth	38544-1SUA	$17.99

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2" DUST COLLECTOR HOOK-UP

14" WOODWORKING BANDSAW

This bandsaw combines reliable service with A-1 performance in cabinet shops, home workshops. Use for cutting plastics or wood or anywhere the cutting of curves and compound curves is required. Precision cast iron tables tilt at 45° for bevel cuts and are grooved for use with a miter gauge.

- Blade to frame distance: 13-1/2"
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- Cutting capacity: 6"
- 1 HP, single phase, 115/220 volts, 9/4.5 amps

~~$319.99~~ $239.99

ITEM 32208-6SUA

REPLACEMENT BANDSAW BLADES

- Fits bandsaws above
- Heavy duty carbon steel

BLADE	DIMENSIONS	ITEM	PRICE
14 TPI	93-1/2" x 3/8" x .025"	03099 -0SUA	$7.99
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- Safety trigger
- Adjustable exhaust direction
- Staple/Nail quantity spy glass

Nail size capacity: 1/2" to 1-1/4"; Magazine capacity: 100; Operating air pressure: 55 to 95 PSI; Air inlet size: 1/4" NPT

~~$69.99~~ $45.99

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5/8" STAPLES (500 PK.) ITEM 44684-0SUA — $2.99

1" STAPLES (500 PK.) ITEM 44685-0SUA — $2.99

1" BRADS (1000 PK) ITEM 44686-0SUA — $2.99

1-1/4" BRADS (1000 PK.) ITEM 44688-0SUA — $2.99

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18 Volt; 1.7 Ah. battery cells; 7/8" stroke; 2800 FPM; Weight: 6 lbs.

$69.99

ITEM 43141-2SUA

18 VOLTCORDLESS, 5-3/8" CIRCULAR SAW KIT

Includes charger and battery. Blade and rip fence sold separately

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RIP FENCE ITEM 37449-1SUA — $3.99

RECIPROCATING SAW BLADES PK. OF 15 ITEM 40986-6SUA — $6.99

18 VOLT CORDLESS COMBO PACK

Includes 18V, 5-3/8" circular saw, drill/driver, heavy duty reciprocating saw, flashlight, two interchangeable batteries, charger and case.

ITEM 45803-4SUA — $139.99

18 VOLT CORDLESS, VSR DRILL/DRIVER KIT WITH 3/8" KEYLESS CHUCK

Balanced T-handle design. Includes 6 pc. screwdriver bit set, 6 pc. drill bit set, magnetic extension bit charger, 18V battery & carrying case.Variable speed reversible. Tool weight: 4.2 lbs.

ITEM 44849-1SUA — $39.99

18 VOLT REPLACEMENT BATTERY

For the above tools.

ITEM 37145-1SUA — $29.99

18 VOLT BATTERY CHARGER ITEM 43933-0SUA — $17.99

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LIMITED QUANTITIES

ROTOZIP SPIRAL SAW

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- No-fall bump-off switch
- Reinforced 10 ft. rubber cord
- Bayonet style removable base and depth guide
- Factory reconditioned, factory perfect

~~$59.99~~ $39.99

ITEM 55029-3SUA

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- 1 quart cup
- PSI: 50-70
- Air inlet: 1/4" NPT
- 2 position nozzle adjusts spray pattern
- CFM: 9.5 @ 50 PSI

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Cantilevered Display She

By Dave Munkittrick

Strong, glueless joints support these elegant, cantilevered shelves.

Whatever you collect—rocks, porcelain, folk art or photos of your Schnauzer—it'll get the attention it deserves when displayed on these shelves. The simple design is wide open at the front and sides so nothing interferes with what's on display. The stepped-back shelves allow ambient light to flood each shelf.

If you're thinking of making some gifts for the holidays, consider these shelves. It's almost as easy to make a dozen as it is to make one. Best of all, these shelves knock down to five easy pieces and six little screws that can be boxed up and shipped to anyone on your list. If you're like me, building these shelves is a lot easier than writing a holiday letter!

These shelves are:
- sturdy
- lightweight
- easily knocked-down for shipping
- fun to make
- easy to mass produce.

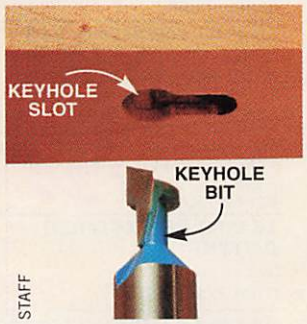
All the curves and tapers make the shelves look tricky to build. But, the joinery is simplified by making all the cuts on square stock before any of the curves and tapers are added. Most of the shaping is done on the bandsaw and tablesaw, followed by a little handwork with a plane or power sander.

The shelves are locked into the supports with bridle joints. The bridle joints consist of dadoes that wrap around three sides of the support. Notches are then cut into the back of each shelf to fit the dadoes (Fig. B). The result is a strong, glueless joint that supports the shelf only at the back.

You'll need a planer, bandsaw, router, drill, belt sander or hand plane and a dado set for your tablesaw. Materials will run anywhere from $25 in pine to $125 in finer hardwoods, such as the figured maple we used here. You'll need about 7 bd. ft. of 4/4 stock for the shelves (this may be the perfect opportunity to use that beautiful board you've been saving for years!) and about 5 bd. ft. of 8/4 stock for the supports.

Start your shelves by cutting your stock according to the Cutting List on page 87. Machine the supports first (Photos 1 through 4) then fit and shape your shelves (Photos 5 through 11). Sand the completed shelves to about 220 grit.

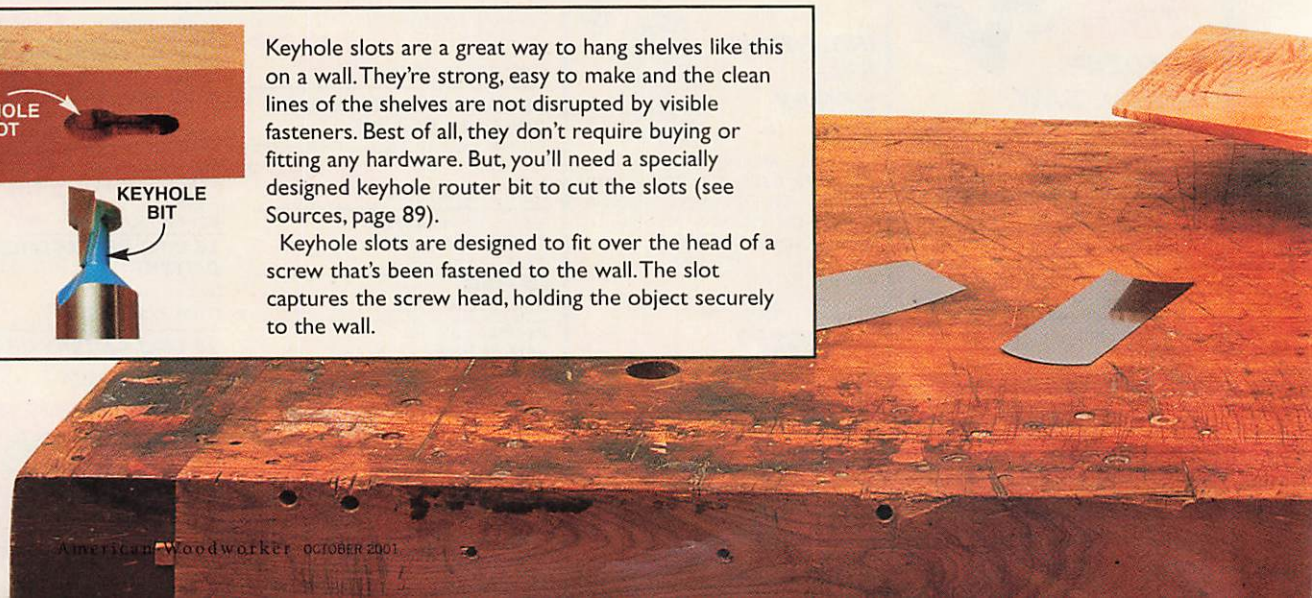
For an easy-to-apply, durable finish we used a wipe-on polyurethane (see Sources, page 89). It goes on like any oil finish but dries fast and hard. For extra protection, apply a coat of paste wax after the oil dries.



STAFF

Keyhole slots are a great way to hang shelves like this on a wall. They're strong, easy to make and the clean lines of the shelves are not disrupted by visible fasteners. Best of all, they don't require buying or fitting any hardware. But, you'll need a specially designed keyhole router bit to cut the slots (see Sources, page 89).

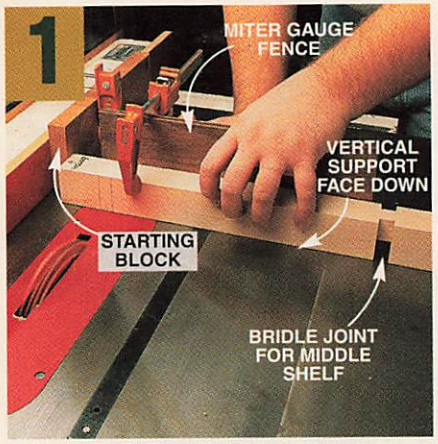
Keyhole slots are designed to fit over the head of a screw that's been fastened to the wall. The slot captures the screw head, holding the object securely to the wall.



ART DIRECTION: PATRICK HUNTER • PHOTOGRAPHY: MIKE HABERMANN, UNLESS OTHERWISE INDICATED • ILLUSTRATION: DON RAYMOND AND FRANK ROHRBACH

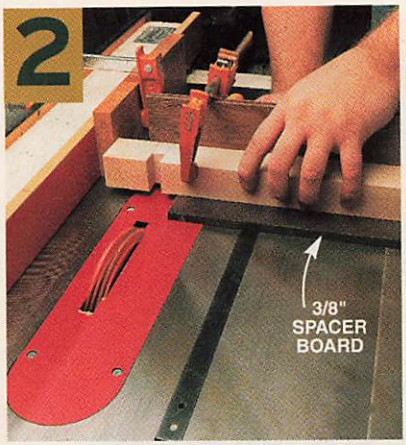
lves

Make the Supports

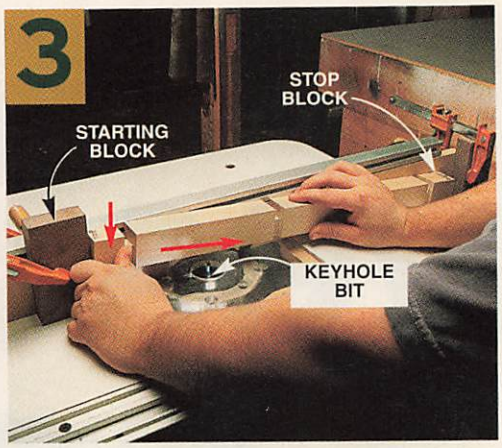


Cut the deep dado on the front side of the support using a long miter gauge fence and a starting block. This is the first step in creating the bridle joint that locks the shelf onto the supports.

The blade guard must be removed for this cut. ***Be careful.***



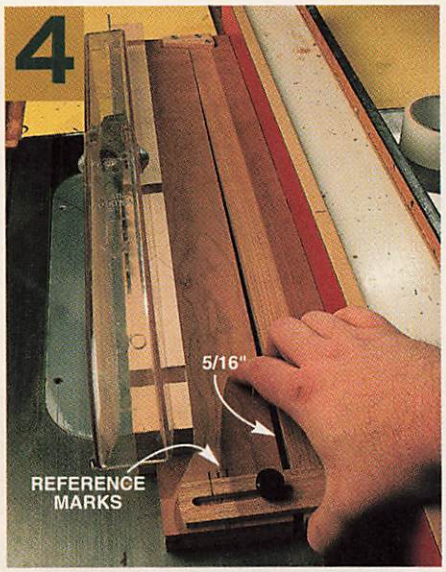
Cut the two shallow dadoes on the sides of the supports after slipping a 3/8-in. spacer board under the workpiece. You must cut all the dadoes for each shelf before moving on to the next. That way you keep the same fence and blade setting for each cut, which guarantees perfect alignment of the dadoes on all three sides of the support.



Cut a keyhole slot on the back of the supports using your router table and a keyhole bit (see Sources, page 89). Brace the top of the support against a starting block and lower the vertical support onto the keyhole bit until it rests flat on your router table. Slide the support forward against the stop block to finish the cut.

Tip

Mark the top, bottom and face of each support. It's easy to get disoriented machining the stock when it's square (see Oops!, page 88).



Cut the tapers on the supports with a shop-made jig (Fig. A), or on a bandsaw.

Taper the sides first.

- Set a 5/16-in. gap between the two halves of the taper jig for the first side cut.
- Set the gap at 5/8 in. for the second side cut.
- Move the fence 1/4-in. further away from the blade, set the gap at 3/4 in. and cut the front taper.
- Mark each setting on the jig for future reference.

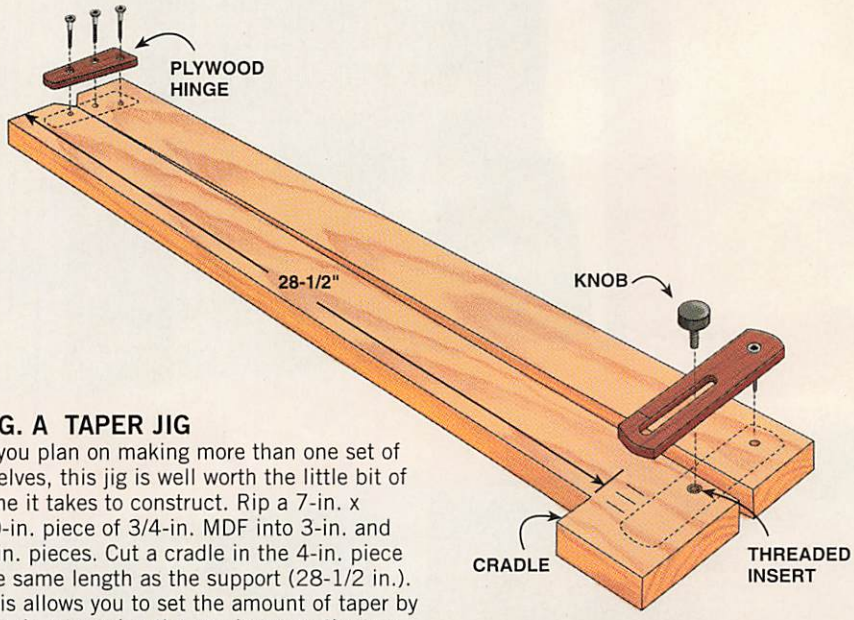
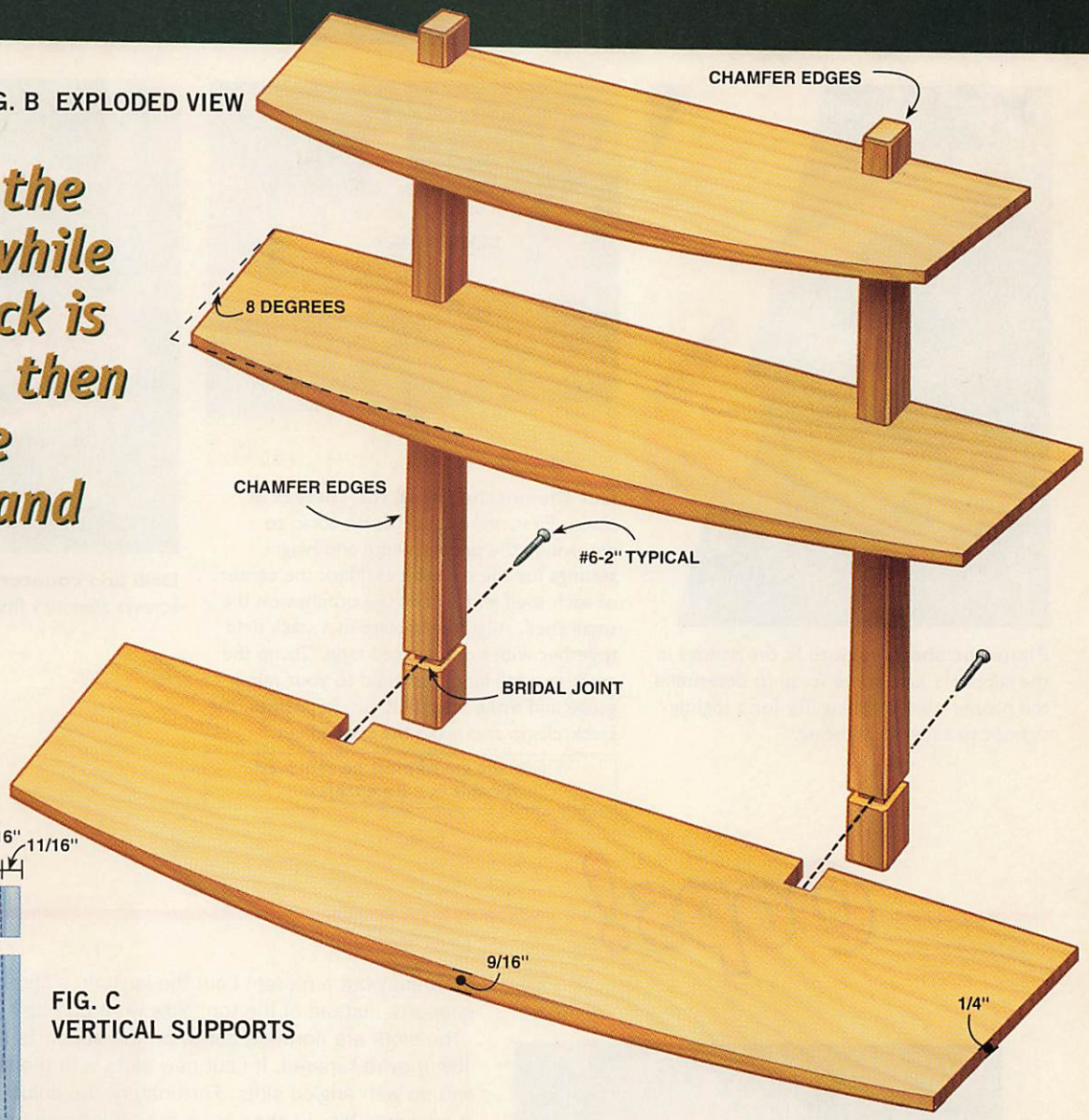


FIG. A TAPER JIG

If you plan on making more than one set of shelves, this jig is well worth the little bit of time it takes to construct. Rip a 7-in. x 30-in. piece of 3/4-in. MDF into 3-in. and 4-in. pieces. Cut a cradle in the 4-in. piece the same length as the support (28-1/2 in.). This allows you to set the amount of taper by simply measuring the gap between the two halves of the jig. Use 1/4-in. plywood to make the hinge and slide. Add a knob and a threaded insert to secure the slide (see Sources, page 89).

FIG. B EXPLODED VIEW

Cut all the joints while the stock is square, then add the curves and tapers.



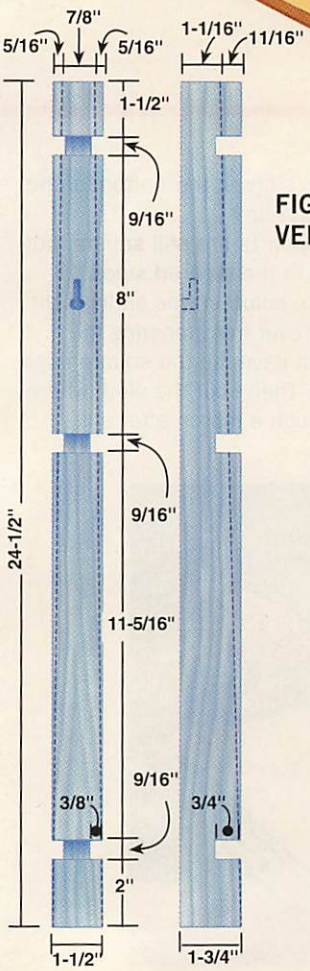


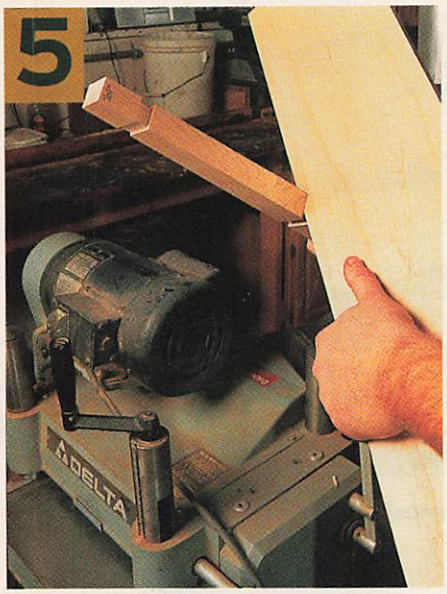
FIG. C
VERTICAL SUPPORTS

CUTTING LIST

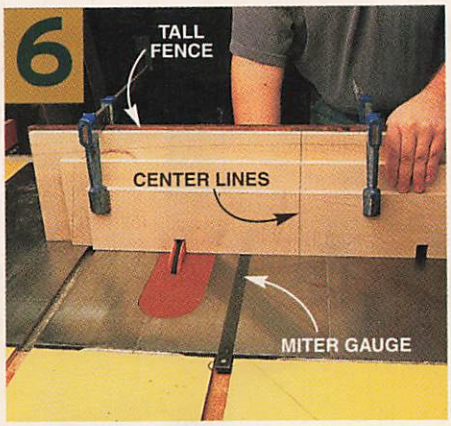
Overall Dimensions: 24-1/2" H x 36" W x 8" D

Part	Name	Qty.	Dimensions	Material
A	vertical supports	2	1-1/2" x 1-3/4" x 24-1/2"	8/4 hard or soft maple
B	bottom shelf	1	9/16" x 8" x 36"	4/4 figured soft maple
C	middle shelf	1	9/16" x 6-1/4" x 31-3/4"	4/4 figured soft maple
D	upper shelf	1	9/16" x 4-1/2" x 28-1/4"	4/4 figured soft maple

Make the Shelves

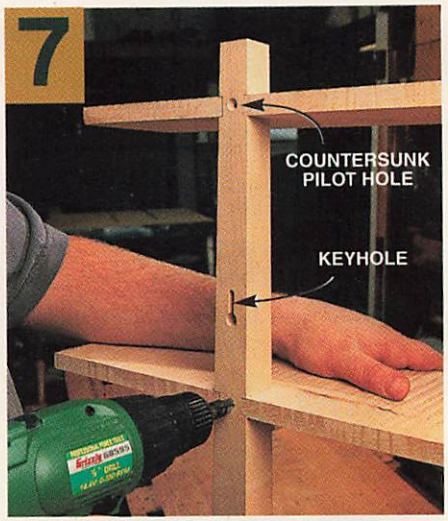


Plane the shelf stock to fit the dadoes in the supports. Use some scrap to determine the proper planer setting. Try for a slightly tight fit to allow for sanding.



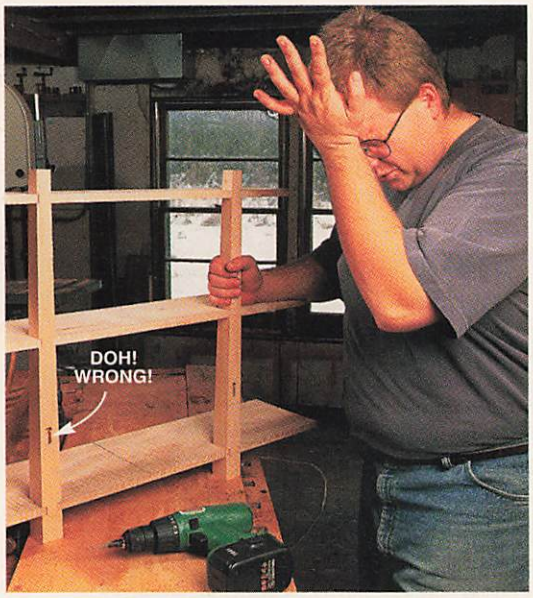
Cut the notches in all the shelves at once. First, make test cuts on scrap to determine the proper width and height settings for the dado blade. Mark the center of each shelf and lay out the notches on the small shelf. Align the shelves in a stack held together with double-faced tape. Clamp the stack to a tall fence fastened to your miter gauge and make your first cut. Reposition the stack, clamp and make the second cut.

The blade guard must be removed for this cut. ***Be careful.***



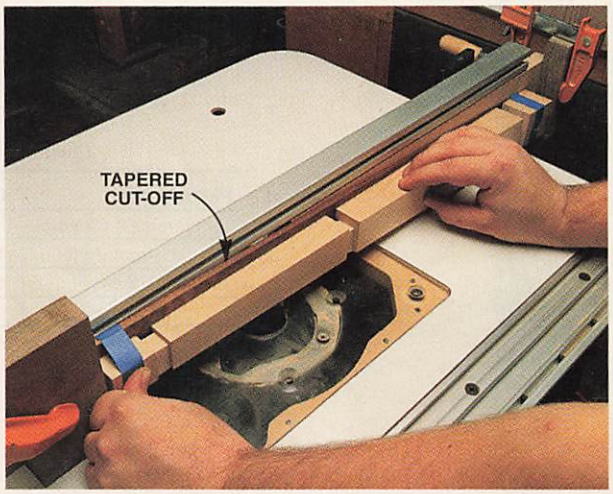
Drill and countersink pilot holes for the screws after dry fitting the shelves.

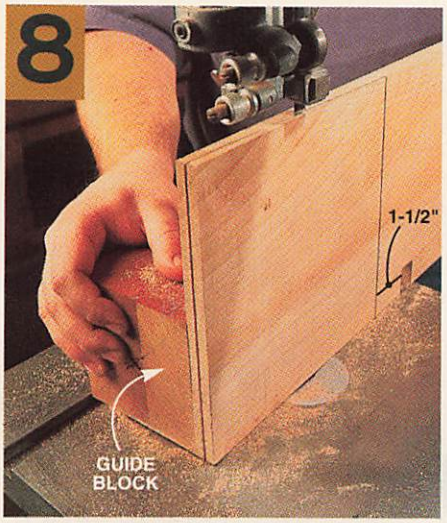
Oops!



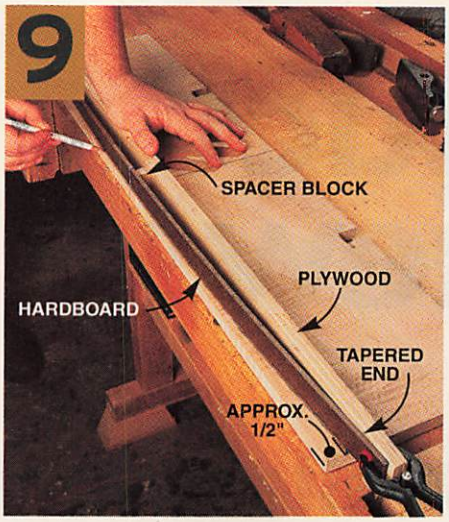
Oh man, what a moron! I cut the keyhole slots at the *bottom* of the supports instead of the top. Now what do I do?

The slots are normally cut when the supports are still square, but now they're tapered. If I cut new slots with the tapered sides I'll end up with angled slots. Fortunately, the solution was sitting right in my scrap bin. I fished out a cut-off leftover from tapering the supports and taped it back in place. That gave me the square edge I needed to reference against the fence. Then I cut the slots where they belong, at the top. Maybe I'm not such a moron after all!

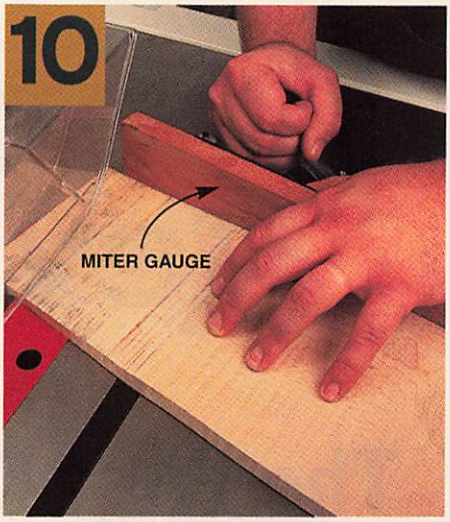




Taper the ends of each shelf on the bandsaw. You want to remove a 1/4-in.-thick wedge that ends about 1-1/2 in. from the notch. Use a block of wood as a guide to keep the shelf perpendicular to the table. Stick the block to the shelf with double-faced tape.



Lay out the curve on the front edge of each shelf. Clamp a 1/4-in. hardboard strip on the ends of a 40-in.-long piece of wood or plywood and add a 3/4-in. spacer block in the middle. Taper the ends of the plywood to create a fair curve. Cut the curve on the bandsaw.

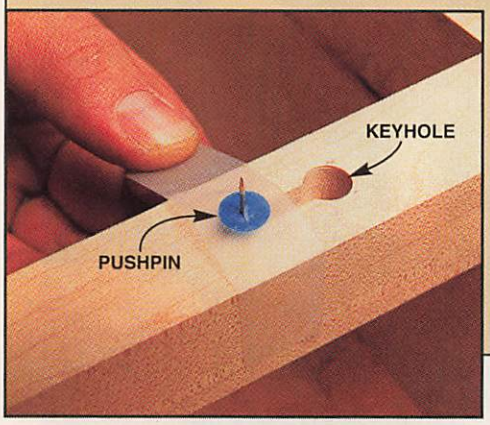


Cut an 8-degree angle on the shelf ends using a miter gauge on the tablesaw.

Tip

Installation

Keyhole hangers are about as strong a wall-mounting system as you can get. But getting two screws spaced perfectly on your wall, without leaving multiple puncture wounds, can drive a grown man to tears. After the scars of my first attempt healed (on my ego as well as the wall), I came up with a solution. Take two of those little plastic pushpins for bulletin boards and slide them into the keyholes. Hold them in place with a little tape. Set a small level on the shelf. Position the shelf on the wall, check for level, and push. Voila! The pins mark the exact spot. Hanging the shelves just became a no-brainer. *AW*



Shape the bottom taper (grid area) with a hand plane or power sander. The object is to create an even 1/4-in. thickness across the ends and a sweeping curve on the front of the shelf (Fig. B). Take care not to remove any material around the notch or you'll ruin the fit of the shelf to the support.

Sources

McFeely's
(800) 443-7937
www.mcfeelys.com
Keyhole bit, #10.24.15; $15
Threaded insert for jig, #3004-EZ 1/4 in. - 20; $8/25 pack
Three-point knob, #JK-0429, 1/4 in. - 20; $1.

Highland Hardware
(800) 241-6748
www.highlandhardware.com
Double-faced tape, #10.01.51, 3/4 in. x 36 yards; $10
1 qt. satin wipe-on poly, #19.31.04; $11
1 lb. Briwax clear, #19.49.70; $15.

MacBeath Hardwood
(800) 479-9907
www.macbeath.com
Hard maple support blanks, 1-3/4 in. x 1-3/4 in. x 36 in.; $11 each
Figured soft-maple stock, $6/bd. ft. for regular grade to $15/bd. ft. for AAAA.

Product Reviews

The First Cordless Router

The cordless revolution takes another leap forward! Porter-Cable will soon introduce the world's first cordless router, the 9290. It's expected to be available in October, and will be priced at around $250.

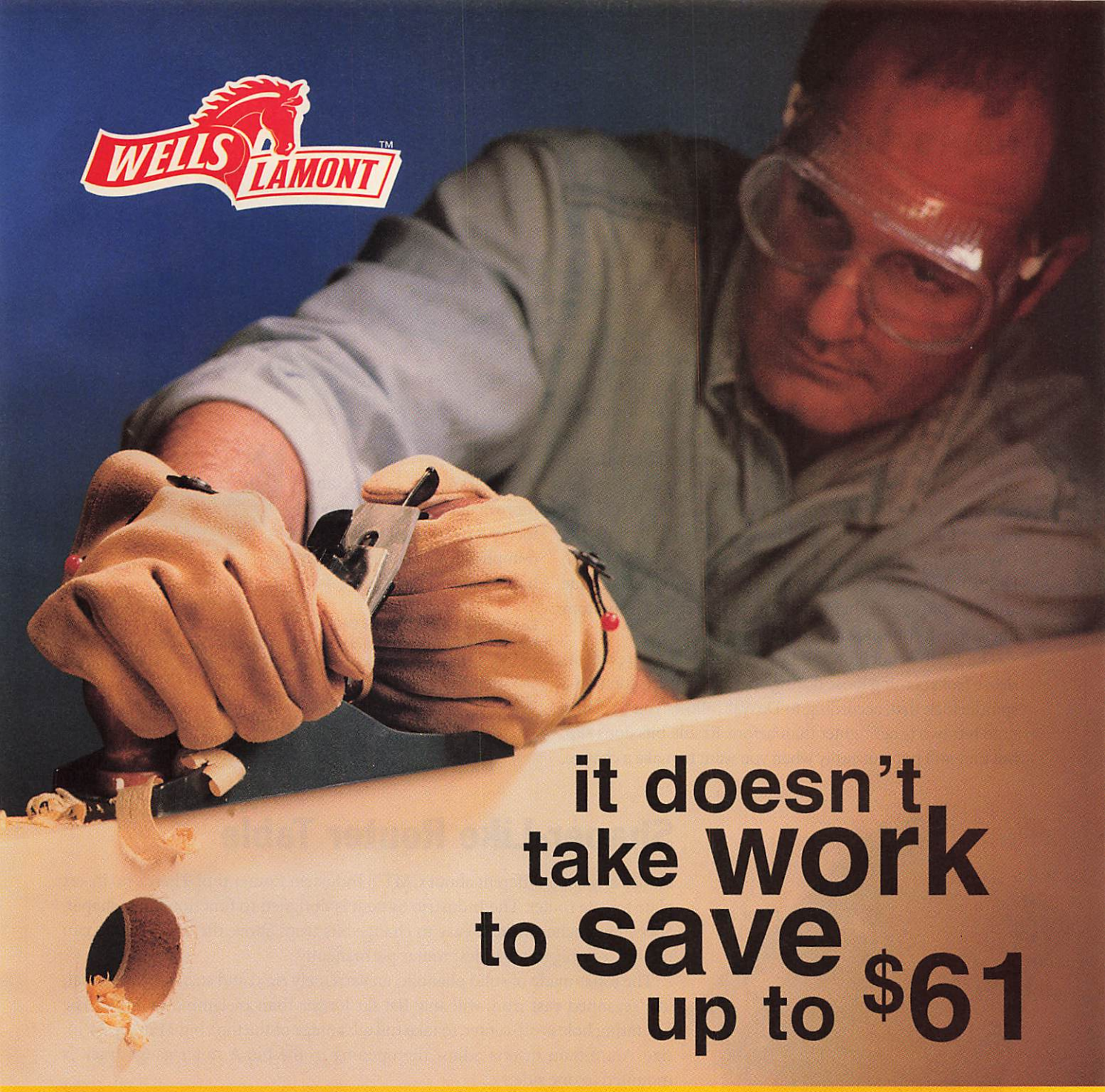
This router is based on the popular Porter-Cable 690, and has a motor that's compatible with the 690's standard, plunge and D-handle bases, plus accessories such as the precision edge guide and dust-collection shroud. The 19.2-volt battery is the same one used in Porter-Cable's drill, circular saw and newly introduced jigsaw. The 9290 cordless router runs at the standard 23,000 rpm, takes 1/4-in. and 1/2-in. bits (with optional 1/2-in. collet), and has a spindle lock for one-wrench bit changing (hallelujah!). The weight is approximately the same as the 690, although the cordless version is more top-heavy because of the high battery location.

The big question is, how much wood can this router cut? It hasn't been available for us to do a real hands-on test, but it appears that this router is best for light to moderate routing, especially edge trimming and profiling. The manufacturer claims that a single charge will cut about 100 ft. of 1/2-in. roundover in oak. That's enough to rout the edges of a kitchen's worth of cabinet doors, but that isn't exactly hogging off a lot of wood. The cordless 9290 has a 600-watt motor, compared to the 1,200-watt motor of a model 690, so clearly it is less suited for general-purpose work. If you already have a couple of corded routers, however, and your work frequently calls for short bursts of edge routing, this would be a very handy machine.

Porter-Cable Cordless Router
Model 9290; $250
Porter-Cable
(800) 487-8665
www.porter-cable.com

PHOTO COURTESY OF MANUFACTURER

ART DIRECTION: PATRICK HUNTER • PHOTOGRAPHY: STAFF, UNLESS OTHERWISE INDICATED



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Improved Cordless Drill

You've got to hand it to DeWalt. Instead of plunking the latest, greatest battery into an old drill and calling it new, they completely redesigned every other component of their top-selling line of XRP drill/drivers. These drills are new from the battery up, and they exhibit impressive low-end torque and faster top speeds than other cordless drills.

The XRP family includes 12-volt, 14-volt and 18-volt drill drivers. We think the new 12-volt DW980, which has a 1/2-in.-capacity chuck, infinitely variable speeds from 0 to 1,800 rpm and 22 clutch settings is the best choice for general woodworking.

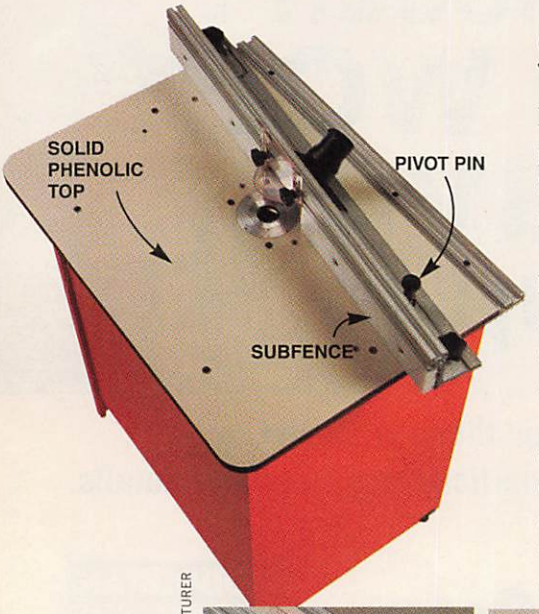
The DW980 offers a new DeWalt-made motor that produces 350 in.-lbs. of torque. It's coupled with an all-metal, transmission with *three* speeds (0 to 450 rpm, 0 to 1,400 rpm and 0 to 1,800 rpm). At low speed (0 to 450 rpm), the DW908's increased torque reminds me of my corded drill. DeWalt's industry-first third speed kicks out as much torque at 1,800 rpm as current models do at 1,400 rpm. The bottom line: More torque at faster speeds.

The Jacob's chuck on the DW980 ratchets to prevent its sleeve from coming loose during operation. It also contains a spindle lock that, according to DeWalt, allows you to clamp onto bits two times tighter than before. Result: bits don't slip, but they still pop out easily when you want to make a change.

The DW980 is probably more drill than most of us need for woodworking, but that extra oomph will sure come in handy for home improvement projects.

DeWalt XRP 12V Cordless Drill
Model DW980K-2 (kit includes drill, two XR extended run-time Ni-Cad batteries, a one-hour charger and a carrying case); $170
DeWalt Industrial Tool Company
(800) 433-9258
www.DeWALT.com

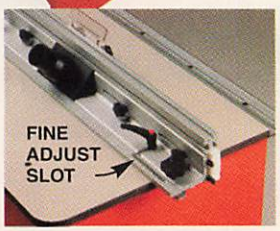
Shaper-Like Router Table

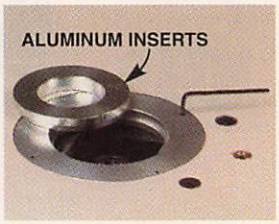


Notice anything different about CMT'S Industrio Router top? There's no insert plate for the router. The Industrio System is designed to function like a shaper. Special wrenches make it easy to change bits from above the table, so you can mount your biggest, baddest router permanently.

The top is made of solid phenolic, an extremely rigid and stable material that, like seasoned cast iron, will stay flat far longer than melamine or MDF. The mounting hole is off-center, to take full advantage of the top's big 31 in. by 24-in. size. Aluminum inserts adjust the opening to the bit. A miter gauge track is mounted to one side.

The fence is versatile and very easy to adjust. It's made from anodized extruded aluminum and incorporates three high-density plastic subfences that adjust laterally for safe, zero-clearance routing. The outfeed side of the fence is adjustable, for jointing operations. It includes a dust collection port, slots for hold-downs, featherboards, blade guards and other accessories. End clamps quickly lock the fence anywhere on the top. In addition, the fence pivots for fine adjustments and locks securely.





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Industrio Routing System (top, fence and cabinet); $520, top only; $240, fence only; $210.
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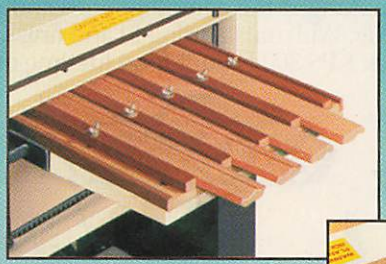
Runaway Hobby - "Thanks to Woodmaster, what started as a hobby is now a full-time millwork business."
D. A. Probst, Pennsylvania



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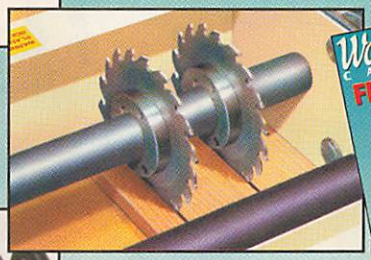
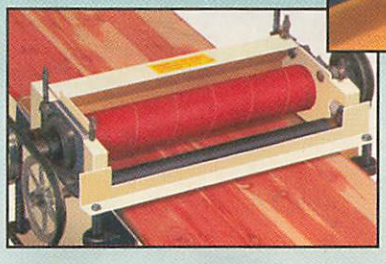


New ripsaw attachment lets you gang-rip with power feed in a fraction of the time it takes for separate hand-fed passes on an ordinary table saw.



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Long Bed 6-in. Jointer

Powermatic's new PM 54A 6-in. jointer trumps the field with a 66-in.-long bed—almost a foot longer than any other 6-in. machine, and comparable in length to the beds on most 8-in. jointers. Bed length is a big deal in a jointer because it determines the length of stock you can joint (usually 1-1/2 times the length of the bed). That means you can joint 8-ft. boards on the PM 54A, something you can't do on any other 6-in. machine.

PHOTO COURTESY OF MANUFACTURER

Another innovation on the PM 54A is the dual-action adjustment lever. Traditionally, jointers employed either levers or wheels to raise and lower the infeed table. Levers are great for making quick, coarse adjustments, but wheels work better for making fine adjustments. The PM 54A allows you to make both kinds of adjustments with a lever. To make fine adjustments, you just twist the handle. Each full rotation moves the table by only 1/16 in.

The PM 54A comes equipped with a three-knife cutterhead and a 1-hp. motor. Its 4 in. by 38-in. fence tilts left and right, with positive stops at 45 and 90 degrees. A 4-in. dust collection port is integrated into the enclosed base. Priced at $750, the PM 54A is positioned right between other good-quality 6-in. and 8-in. jointers.

Powermatic PM 54A 6-in. Jointer; $750
Powermatic
(800) 274-6848
www.powermatic.com

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Builder / Furniture Making Enthusiast

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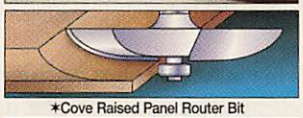
#1438 Raised Panel Door Video **$9.95**



*Cove Raised Panel Router Bit

*Ogee Combination Rail & Stile Bit

1/4" Shank Raised Panel Set

Carbide Tipped! Includes 2" dia. Cove Raised Panel bit with ball bearing and Ogee Combination Rail and Stile bit.

$69.95
SET #1301

1/2" Shank Raised Panel Set

Carbide Tipped! Includes 3-1/2" dia. Cove Raised Panel bit with ball bearing and Ogee Combination Rail and Stile bit.

$79.95
SET #1302

1/2" and 3/4" Shaper Set

Carbide Tipped! Includes 4-5/8" diameter Cove plus Ogee Combination Rail and Stile Shaper Cutters.

$99.95
SET #1303

15 Piece Router Bit Set

MLCS Anniversary Set at a once-in-a-lifetime price!

Featuring these carbide tipped bits:
4 Straight (3/16", 1/4", 1/2", 3/4"),
1 Cove (1/2")
1 Round Over (3/8"),
1 Roman Ogee (5/32")
1 14° Dovetail (1/2"),
1 Rabbeting (3/8")
1 Panel Pilot
1 45° Chamfer,
1 Flush Trim (1/2"),
1 Hinge Mortising (1/2"),
1 Round Nose (1/4")
1 V-Groove (3/8")
1 allen wrench and
1 bearing to convert Round Over into Beading bit.

$39.95
1/4" Shank • **#1442**
1/2" Shank • **#1443**

WOOD STORAGE BOX INCLUDED

30 Piece Router Bit Set

Celebrate our Anniversary by saving money!

Featuring these carbide tipped bits:
3 Cove (1/4", 3/8", 1/2"),
2 Flush Trim (3/8", 1/2")
6 Round Over (1/8", 3/16", 1/4", 5/16", 3/8", 1/2")
5 Straight (1/4", 5/16", 3/8", 1/2", 3/4")
1 Chamfer (45°),
1 Slot Cutter (1/4"),
1 Rabbeting (3/8")
1 V-Groove (1/2"),
1 Bevel (25°)
1 Panel Pilot (3/8")
3 Round Nose (1/4", 3/8", 1/2"),
3 Dovetail (14°-1/2", 5/8" & 9°-3/8")
2 Roman Ogee (5/32", 1/4")
1 Allen Wrench and 1 bearing to convert Round Over into Beading bit.

$99.95
1/4" Shank • **#1444**
1/2" Shank • **#1445**

WOOD STORAGE BOX INCLUDED

66 Piece Router Bit Set

An amazing price for our most complete set!

Includes the 30 Piece Set (left) plus these bits:
Straight (7/16", 5/8", 1"), 1 Bevel (30°),
1 Groove Forming Classical (3/4"), 1 Keyhole (3/8"),
Hinge Mortising (1/2", 5/8", 3/4"), Classical Bit (3/16" r),
3 Core Box (1/4", 3/8", 1/2"), 1 Dish Cutter (1"),
V-Groove (3/8", 5/8"), Cove (1/8", 3/16", 5/16"),
1 Flat Bottom Sign Lettering (5/8" 60°),
1 Double Cove & Bead, 1 Ogee Filet (1-3/8"), 1 Cove and Bead (5/16" r), 2 Edge Beading (1/4", 3/8"),
Dovetail (7.5°-1/4",14°-3/4), Slot Cutter (3/8")
1 Point Cutting Round Over (1/2"),
1 Flat Bottom Round Over (1/4" r),
1 Multi Bead/Reed Bit (1/8" r),
1 Double Round Over (5/32" r),
1 Cove Sign Lettering (5/8" 60°),
Chamfer (30°, 22.5°, 15°),
4 bearings & allen wrench

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1/2" Shank • **#1447**

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- **CUT OFF TOOL** Cut nuts, bolts, steel rods, wire netting.

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1/2" shank Carbide Tipped set. Make kitchen cabinets, raised panel doors, table tops and drawers. For up to 3/4" wood. Includes these bits:

- Glue Joint (1-3/4")
- Drawer Lock (1-3/4")
- Rail & Stile Matched Pair (1-5/8")
- Ogee Raised Panel (2-3/4")
- Round Over & Ogee Door Lip (1-1/4")

$124.95
SET #1449

WOOD STORAGE BOX INCLUDED

16 Piece Forstner Bit Set

Includes these sizes:
1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/8", 1-1/4", 1-3/8", 1-1/2", 1-5/8", 1-3/4", 1-7/8", 2", 2-1/8".

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SET #1418

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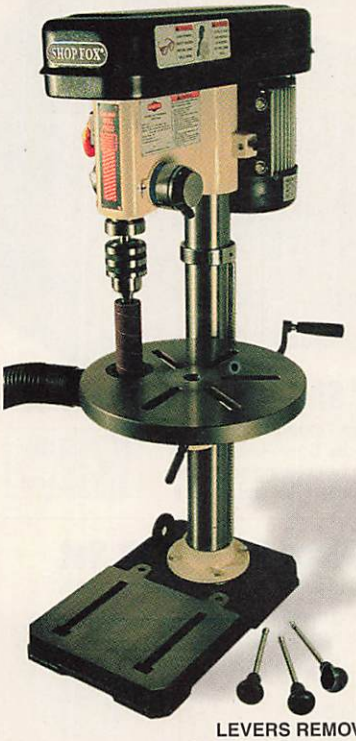
Drill Press/Spindle Sander Combo

What a deal! You can save both money and shop space because the Shop Fox oscillating drill press is two machines in one.

It's big for a benchtop machine, so it has adequate capacities for most drilling operations, including 12 speeds, a 6-1/2-in. throat, 3-1/4-in. stroke, 3/4-hp motor and a 12-3/8-in.-diameter table. The 5/8-in. chuck screws onto the arbor, so it stays put, but it can't grip bits smaller than 7/64 in.

In addition, a patented system makes the spindle oscillate in a 3/4-in. stroke. The table has a hole for the sanding drum with an integral dust collection port. Three sanding drums are included.

This machine performed drilling operations as well as many of the floor-model drill presses we tested last April (AW #86).



LEVERS REMOVED FOR SANDING

It takes less than a minute to change the W1668 from drilling to sanding. Just remove the operator's levers, install a small belt between the arbor pulley and the gear-and-cam oscillating mechanism and align the spindle with the hole in the table.

We got good sanding results, on par with the benchtop spindle sanders we tested last October (AW #82). The W1668 has plenty of power and adequate dust collection, although the hole in the table limits maximum drum size to 2 in.

Shop Fox Oscillating Drill Press
Model W1668; $245, including three-piece sanding drum kit (1 in., 1-1/2 in. and 2-in. dia.)
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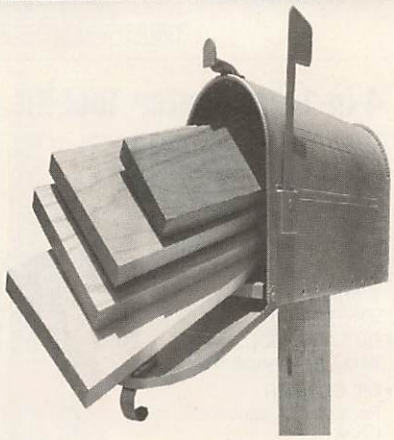

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3 Cove Bits
6 Roundovers
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1 Panel Bit
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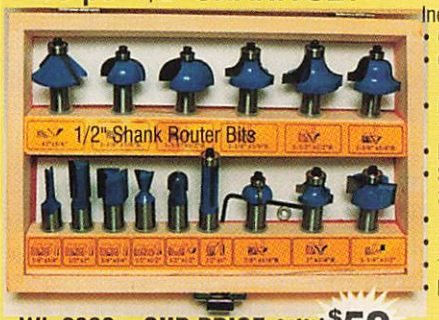
2 Slot Cutters
1 "V" Groove
1 Chamfer
1 Bevel Trim Bit

WL-2010 OUR PRICE *ONLY* $109.set

15-pc 1/2" SHANK SET



Includes–
- Chamfer
- Cove= 1/2"R, 3/8"R, 1/4"R
- Roundover= 1/2"R, 3/8"R, 1/4"R
- Roman Ogee=1/4"R
- Straight Bits= 3/4"R, 1/2"R, 1/4"R
- 1/2" Dovetail
- 1/2" Roundover
- 1"CL Flush Trim
- Rabbet Bit

WL-2022 OUR PRICE *ONLY* $59.set

15-pc 1/4" SHANK SET

same as WL-2022 except 1/4" shank

WL-2021 OUR PRICE *ONLY* $59.set

6-pc CABINET DOOR SET

- 2-pc Rail & Stile (Roman Ogee) • Drawer Lock
- 2 3/4" D Panel Raiser (Ogee) • Door Lip • Glue Joint

WL-2020 $175.*VALUE*
OUR PRICE *ONLY* $119.set

5-pc CABINET DOOR SET

3/4' bore Shaper Cutter
- 1-pc Rail & Stile (Roman Ogee)
- 4 5/8" Panel Raiser (Ogee)
- Door Lip
- Glue Joint
- Drawer Lock

WL-1505 $279.*VALUE*
OUR PRICE *ONLY* $179.set

13-pc DOVETAILSET

WL-2013 $115.*VALUE*
OUR PRICE *ONLY* $59.set

6-PIECE BULLNOSE SET

WL-2013 $115.*VALUE*
OUR PRICE *ONLY* $89.set

8-pc CLASSICAL SET

- 2 Classical=5/32" R, & 1/4" R
- 1 Wavy • 1 Filet
- 2 Ogee=5/32" R, & 1/4" R
- 2 Roman Ogee=5/32" R, & 1/4" R

WL-2016 $150.*VALUE*
OUR PRICE *ONLY* $99.set

3-pc CABINET DOOR SET

- 2-pc. Roman Ogee Rail & Stile
- 2 3/4" Ogee Panel Raiser

WL-2019 $100.*VALUE*
OUR PRICE *ONLY* $65.set

5-pc COVE SET

WL-2015 $89.*VALUE*
OUR PRICE *ONLY* $59.set

5-pc ROUNDNOSE (CORE BOX) SET

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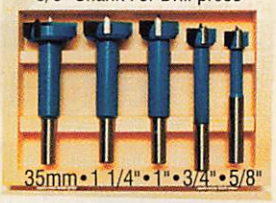
5-pc CARBIDE TIPPED FORSTNER BIT SET

3/8" Shank For Drill press



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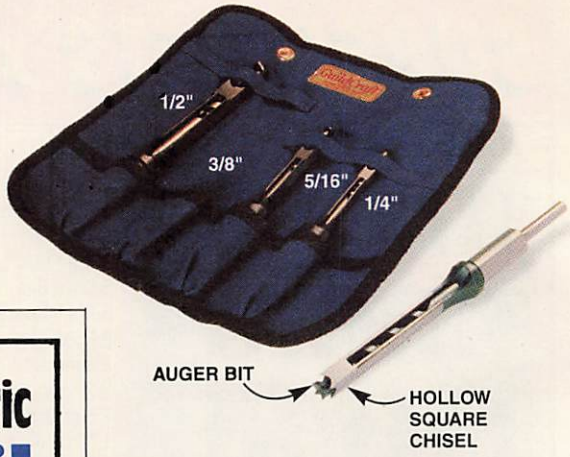
Affordable Mortising Chisel Sets Stay Sharp

If you don't want to spend a fortune on chisels and bits for your mortiser, but have been frustrated by the short life span of inexpensive sets made in China, check out this new offering from Fisch Precision Tools.



Their new Guildcraft mortising chisel sets are Chinese made, but Fisch controls the manufacturing process and imports their own high-quality steel. (Fisch is known for their top-quality professional chisel sets—they supply the Stickley Furniture Company). The result is good quality at a modest price, perfect for the home woodworker. The four-chisel set, including the tool roll (a nice perk), costs $70.

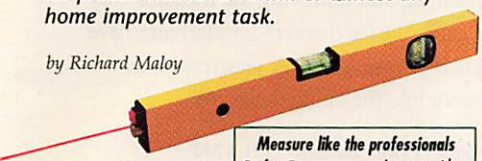
Guildcraft chisel sets have an excellent finish grind and are a joy to use because they stay sharp. The secret is the steel. Guildcraft chisel sets are consistently hardened, so their cutting edges are uniform and less likely to break down. If you don't abuse them, these sets will last a long time, especially if you have a slow-speed (1,720 rpm) mortiser. High-speed mortisers (3,450 rpm) are hard on *all* mortising chisels. Guildcraft chisels mount with a standard 5/8-in. bushing. You may have to add the shaft extender supplied with your mortiser in order to chuck the auger bits. (Auger-bit shafts vary in length, depending on the manufacturer. These are short.)

Guildcraft Mortise Chisel Set; $70
Fisch Precision Tools
(724) 663-9072
www.fisch-woodworking.com

Professionals use laser for precise measurements... why don't you?

New Laser Level provides pinpoint accuracy for precise measurements...for almost any home improvement task.

by Richard Maloy



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- Craftsmen
- Interior Designers
- Do-it-Yourselfers

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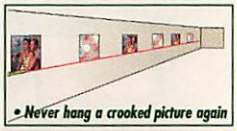
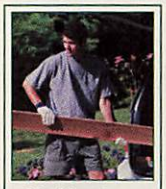
• Lay perfectly straight floor tiles

• Ensure that walls are level



• Never hang a crooked picture again

Even if the project has gone wrong in countless ways, I'll still feel that I need to finish what I started. And I'm the type of person who has to do things on their own. This of course takes more time than I've got, but now with the Laser Level, I can make precise measurements the first time around, leaving no room for errors. The Laser Level is a 16-inch machined aluminum level with an incredible laser light. It can project a dot or a line on any surface...at a distance of up to 1500 feet! That means that anytime you need to line something up or make it perfectly level, all you do is turn on Laser Level and mark the spot. It features high quality horizontal and vertical bubble levels. The handy lens refractor clips onto the end of the unit, letting you select the line or the dot image. The level includes a threaded tripod mount and is inscribed with a ruler with indications to 1/8 inch. It's perfect for everyone from contractors and engineers to interior designers and home craftsmen.



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3X18	.86
3X21	.90
3X23 3/4	.93
3X24	.93
3X27	.96
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4X24	1.10
4X36	1.35
6X48	3.50
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New Router Family

The Makita RF1101 was an Editors' Choice winner in our test of mid-sized routers (AW #85, February 2001). It's one heck of a machine; with a 2-1/4-hp motor and electronic variable speed for both power and versatility.

Now you can get the same great motor in a plunge base (RP1101) or with a D handle (RD1101). The handles on the plunge base are comfortable and the plunge mechanism operates smoothly, to a maximum depth slightly over 2-1/2 in. The base has an adjustable turret with three depth stops and a knob for fine adjustments. A separate dust collection sleeve is included. The D-handle base has a handy trigger-style on-off switch.

You can get the motor with both fixed and plunge bases in a kit, RF1101KIT, or you can buy all three bases separately. Installing and removing the motor is easy because the fixed and D-handle bases have quick-release levers. A setscrew locks the motor into the plunge base. *AW*

Makita Plunge Router RP1101; $240
Makita D-handle Router RD1101; $230
Plunge Router Kit RF1101KIT, (1101 motor, fixed and plunge bases, accessories and carrying case); $300, fixed base, #193103-8; $75, plunge base, part number and price not available, D-handle base, #193104-6; $99.
Makita USA, Inc., (800) 462-5482
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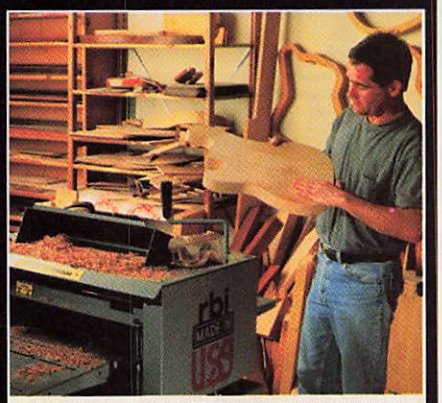
IMPORTANT: Cover removed to show woodplaner components. Do not operate machine without cover.



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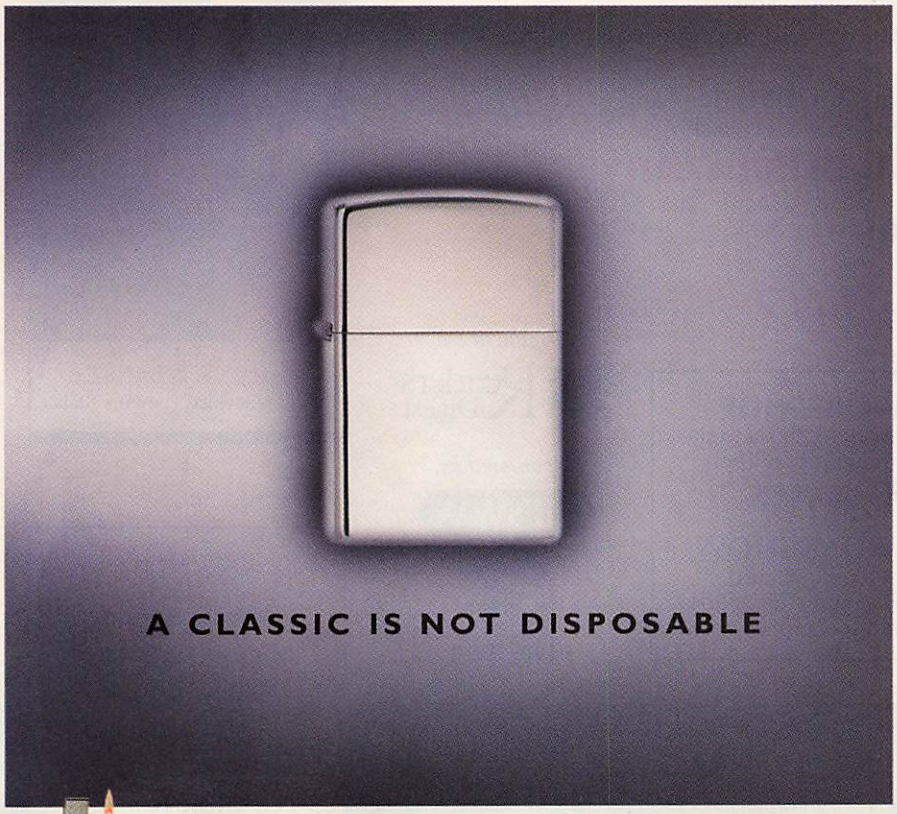

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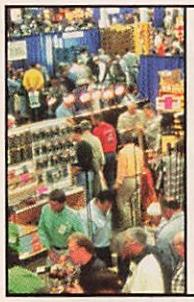

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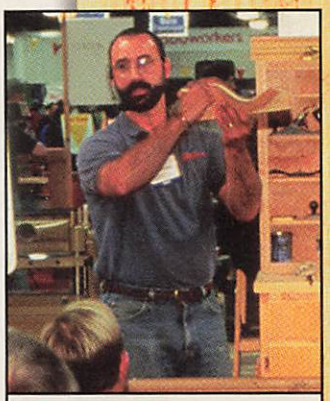

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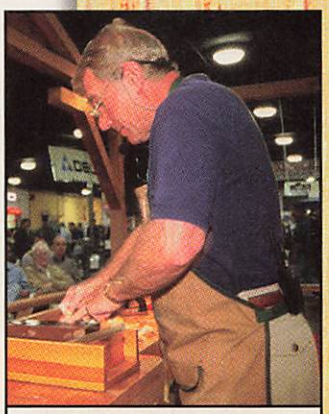

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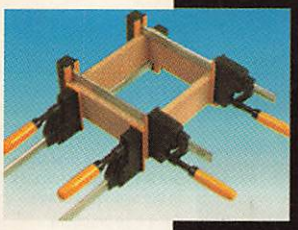

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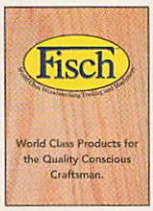

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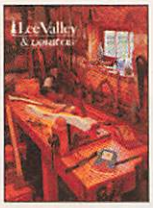

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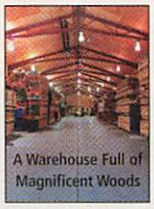

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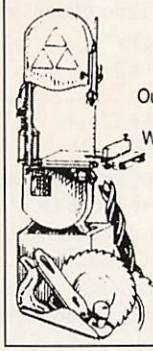

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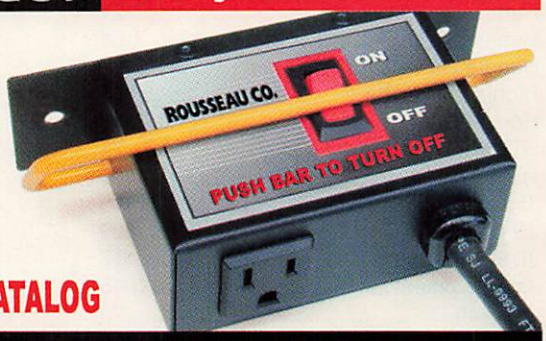

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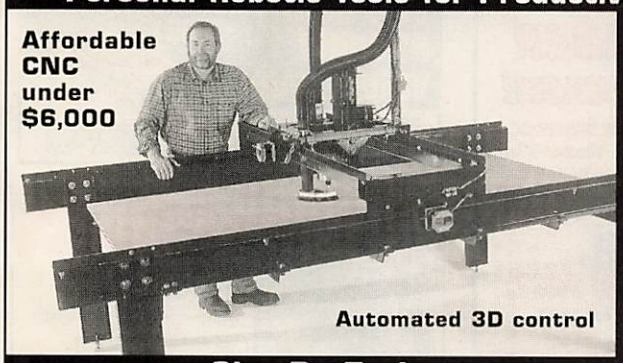

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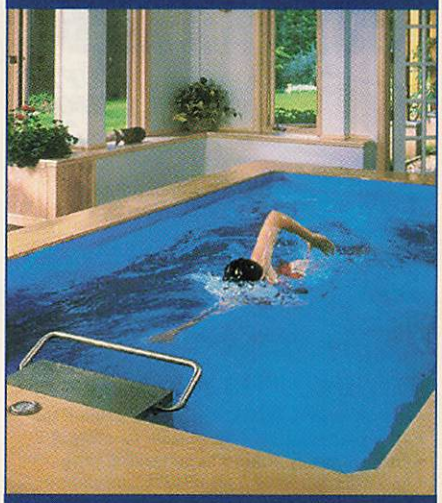

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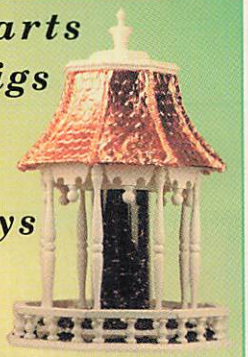

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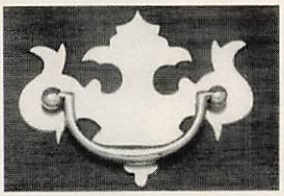

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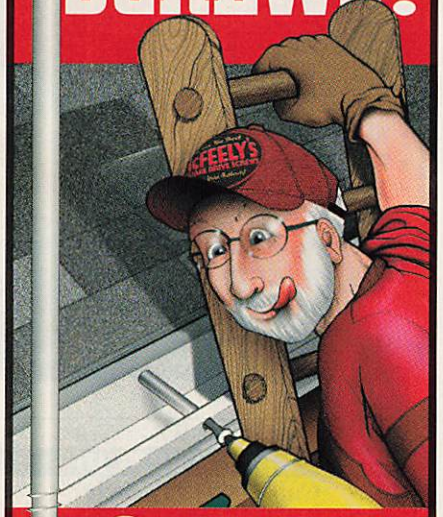
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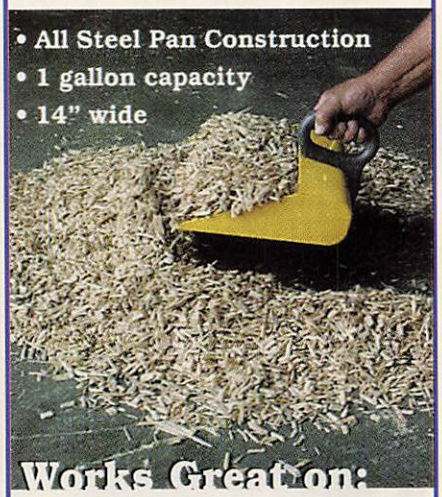

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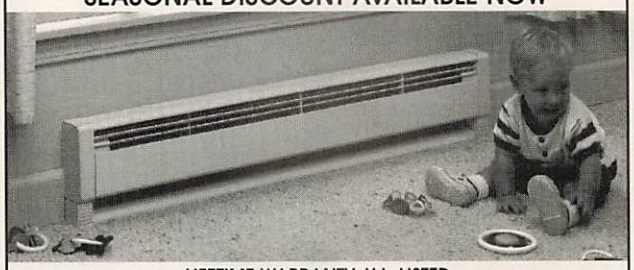

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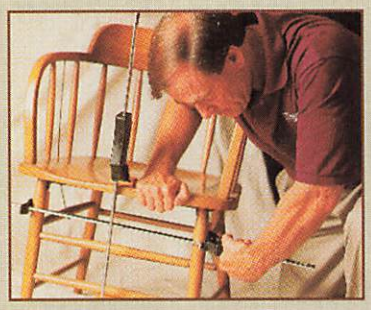

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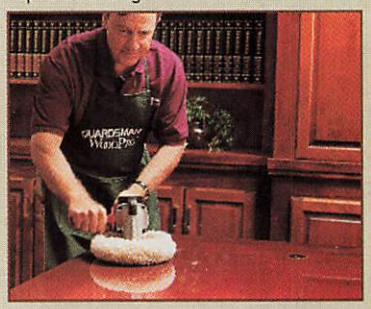

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Birch

This affordable wood is great for both high-end and utilitarian cabinetry.

MIKE HABERMANN

Up to 40 percent of a birch log is light-colored sapwood.

Birch is a hot item at the lumberyard these days, and birch veneer is the all-time most popular hardwood plywood. This isn't a fad. Despite changes in taste and fashion, birch has been in demand for furniture and cabinetry for almost a century.

Birch lumber has a handsome appearance. Because of its fine texture and straight grain, it machines well and routs beautifully. Though hard, birch is easy to sand, and it turns like a dream. Birch plywood is available in a wide range of grades.

These characteristics make birch a great choice for all types of cabinetry. But the best thing about birch is that it looks good with a variety of finishes—it's a great impostor for more expensive woods. I'll show you how to make the most of this durable, versatile and budget-friendly hardwood.

Birch burl is prized by turners.

VESSEL BY RUS HURT

Yellow Birch Rules

Although the birch family *Betulaceae* contains over a dozen domestic species, between 80 and 90 percent of the lumber you'll find at the lumberyard is yellow birch (*Betula alleghaniensis*). Three other species are also commercially harvested and may occasionally be mixed in with yellow birch. Paper birch (*B. papyrifera*) is whiter, but softer. Sweet birch (*B. lenta*) is a bit harder and has a deeper color. River birch (*B. nigra*) is more likely to contain knots. Birch boards average about 6-in. wide, and are available in lengths up to 12 ft. Lumberyards usually stock birch in 1- and 2-in. thicknesses. Home centers carry birch plywood, but may not stock birch lumber.

ART DIRECTION: PATRICK HUNTER • PHOTOGRAPHY: STAFF, UNLESS OTHERWISE INDICATED

BIRCH IS FAMOUS for its light-colored sapwood, but its deeper-toned heartwood, which is known as red birch in the lumber industry, can be even more appealing.

Birch Lumber is Graded for Color

Birch logs contain quite a bit of sapwood. It ranges in color from creamy-white to golden tan (with occasional pink tones), and is distinctly different than the reddish-brown heartwood (photo, at left). Commercial demand for light-colored wood is so strong that birch, like maple, is often graded and sold by its color. You'll pay about a 20-percent premium for color-selected birch.

At the lumberyard, birch boards marketed as "sap" or "white" have been color-selected. Sap birch refers to boards containing at least 85 percent light-colored sapwood. White birch refers to paper birch. Some lumberyards carry it separately from yellow birch, specifically for its white color. Paper birch boards are usually narrow (about 4-in. wide), short (6- to 8-ft. long) and thin (1-in. thick). They're best used to make face-frames and moldings.

Most birch lumber is sold as natural or unselected. There's no difference in the quality of the wood—it just hasn't been sorted for color. Most natural boards contain a combination of sapwood and heartwood, but you'll find light- and dark-colored boards as part of the mix. While light-colored birch grabs all the attention, its deeper toned heartwood (red birch) can be just as attractive. Thick stock (over 1 in.) is likely to contain considerable heartwood. Lower-grade No. 1 common birch lumber contains more knots and other natural defects.

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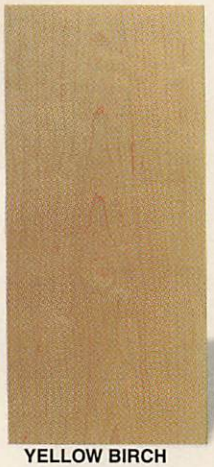
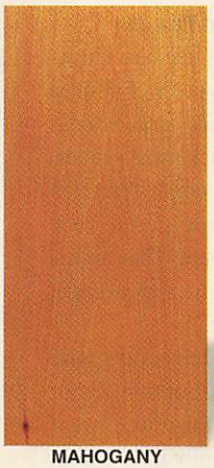
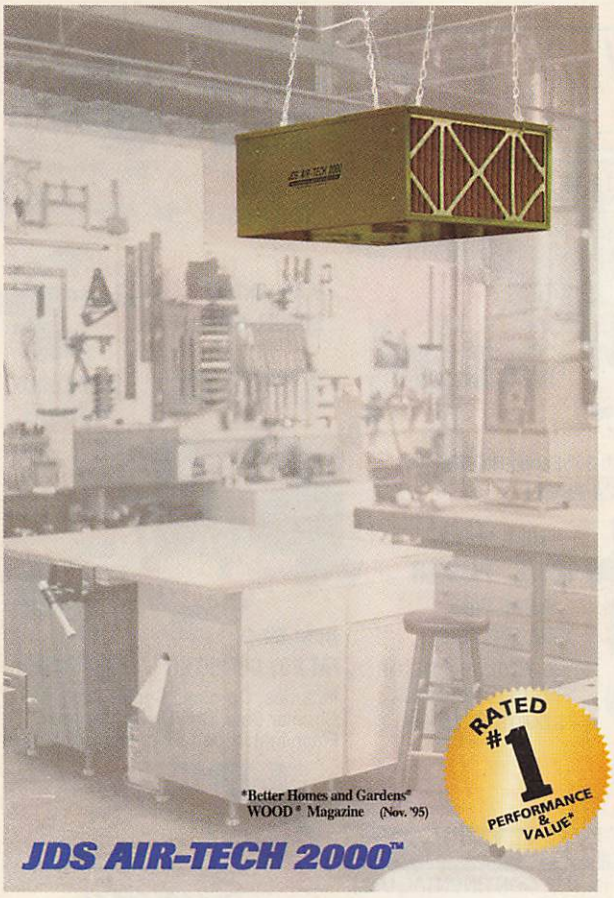

YELLOW BIRCH

CHERRY


MAHOGANY

WALNUT

BIRCH IS A GREAT IMPOSTOR because its figure patterns closely resemble those in cherry, mahogany and walnut. You can dress it up or down just by staining it different colors. Furniture manufacturers have used stained birch in lieu of more expensive hardwoods for decades.



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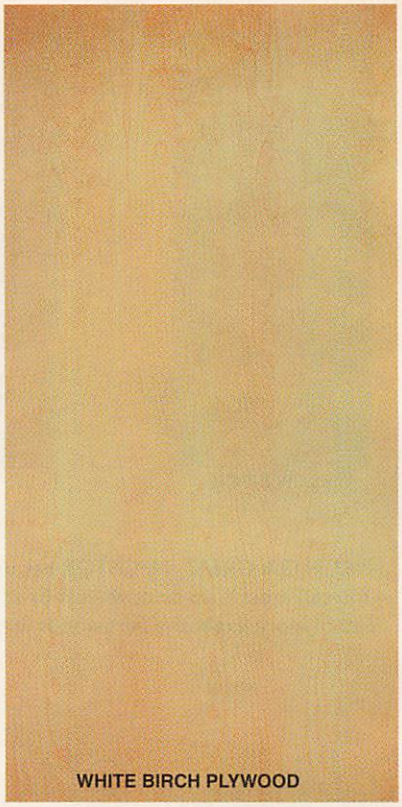
Birch Plywood Has Many Faces

Birch plywood is graded by its color, just like birch lumber. The highest grade is white, followed by uniform light and natural. Lower paint and shop grades cost less. Hardwood lumberyards usually stock most grades.

The faces of white birch ply (here white refers to color, rather than species) are made of top-grade (zero defects), color-matched sapwood veneers. This architectural-quality plywood has a handsome appearance, but it's expensive; around $75 per sheet.

Uniform light and natural birch ply have top-grade veneer faces, in terms of natural defects, but they're not pristinely white in color. In the past, these grades were distinctly different. Today, they're virtually identical in appearance (they're both light colored) and in price; about ten percent less than white ply. Paint and shop grades of birch plywood are worth looking at if you want to save money. They cost about $50 per sheet. Paint-grade birch ply has face veneers that vary in color and pattern match. Shop-grade sheets have some kind of damage or manufacturing defect, but must be 85 percent usable.



TOP GRADES of birch plywood are white and uniform. They're the best choice if you want a clean, pristine look.

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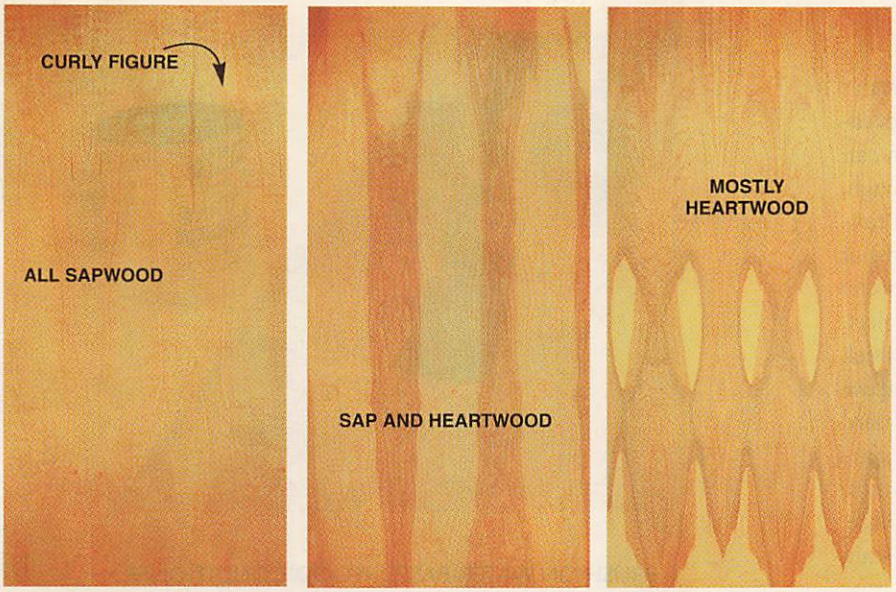

MIDDLE-GRADE birch plywood sold at home centers offers lots of creative possibilities. The veneers may show attractive figure patterns, occasional spectacular curly figure, rich colors, and any combination of sap- and heartwood, including all of one or the other. Staining will minimize contrasting colors, but the only way to make these sheets white is to *paint* them!

It's smart to shop for birch plywood at a home center. They typically stock a mid-level grade, similar to the paint grade at the hardwood lumberyard, but at home center prices. This plywood will vary widely in appearance from sheet to sheet, and will contain minor natural defects, varying amounts of heartwood and slightly less uniform core material, but you'll save up to 50 percent, compared to the top white grades at the hardwood lumberyard. You'll also be able to look through the stack for the best-looking sheets. Take a friend along to help you look, be careful, and leave the stack neat for the next customer.

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Seal Birch Before You Stain

Curly figure is common in birch and occasionally it's spectacular. Flame birch can look as cool as tiger maple. Usually, though, figure is a big nuisance because it's randomly located and hard to see. If you're not careful, a piece with hidden curly figure can end up in the wrong place on your project. One curly board in a tabletop will stick out like a sore thumb, especially if you use stain. It's a good idea to check every board for figure. Just wipe on some mineral spirits; any figure will jump right out. If you're stuck with curly figure in the wrong place, using wood conditioner before you stain helps camouflage it.

BRUSH ON WATER-BASED WOOD CONDITIONER, let it dry and sand lightly before you stain. This process helps the wood absorb water-based stain evenly. Each coat of stain adds a little more color. You can tweak the color by using different colored stains, one over another. Water-based stains dry fast, so you can put on several coats in a day.

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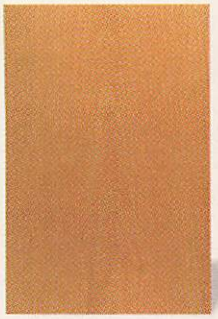
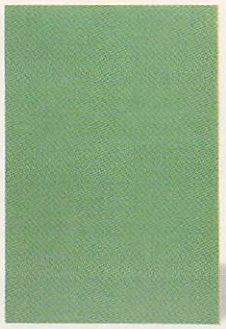
Birch's chameleon-like nature makes it a finisher's dream wood. It looks good with a clear finish, accepts all colors of stains and dyes, and has a smooth surface that's great for painting.



KEEP IT LIGHT. Waterborne polyurethane adds no amber color, so it keeps birch as light as possible. Lacquer finishes are also clear. Oil-based finishes add an amber tone.

IMITATE EXPENSIVE HARDWOODS like mahogany, walnut or cherry. To simulate the open-pored appearance of mahogany or walnut, use a single coat of water-based conditioner before staining. You'll get an evenly colored finish and some stain will darken the pores, just like the real McCoy. To imitate close-pored woods like cherry, use two coats of conditioner. When you stain, the pores won't show up at all.

MATCH OLD BIRCH cabinets or trim moldings that have aged to a uniform honey color by sealing new birch with two coats of water-based conditioner, just as if you were matching a close-pored wood. Then add color, using a golden-oak colored water-based stain.



PAINT IT. Because of its uniform texture and tiny pores, birch provides a smooth surface for painting. It's tougher than pine or poplar, and unselected grades cost about the same. For cabinetry, even the ugliest birch plywood will look great when it's painted.

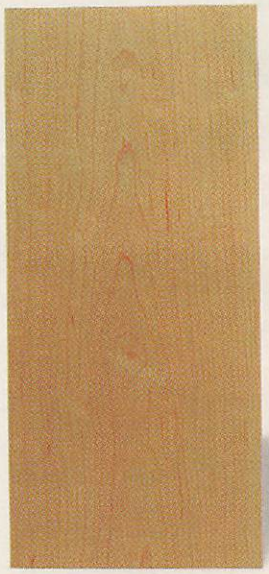
Birch or Hard Maple?

Yellow birch and hard maple look so much alike it's often tough to tell them apart. Plainsawn boards have similar figure patterns. They both have pale sapwood and distinctly darker heartwood. Manufacturers have used them interchangeably for decades.

How do they compare?

- Hard-maple sapwood is whiter.
- Hard maple will make a better cutting block or countertop, but yellow birch is tough enough to stand up to normal dings and dents.
- Both show considerable seasonal movement.
- Both yellow with age.
- Birch machines better. Hard maple is particularly prone to tear-out during edge jointing, and burn marks from dull blades and bits are tougher to remove.
- Birch accepts stain better, although both are prone to blotching.
- Birch costs less. Although demand for light-colored wood continues to push up the price of both species, birch is usually about 30-percent cheaper. *AW*

YELLOW BIRCH



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VISIT THE TOOL CRIB

Spectacular Wood and Where to Get It

by Dave Munkittrick

Great Wood!

PHOTO BY HAL LUM

CHEST OF DRAWERS BY ALAN WILKINSON

Curly Koa

Two things make curly koa precious; it is strikingly beautiful and very rare. Koa only grows at the higher elevations of the Hawaiian Islands and less than 3 percent of all koa is figured. Curly koa is truly the rarest of the rare.

Crowned the king of the Hawaiian forest, *Acacia koa* is a true American tropical exotic (another rarity) that can reach a height of 100 ft. with a 5- to10-ft.-diameter trunk. A scarce natural resource like koa demands protection and fortunately it gets it. Controlled cutting and an aggressive reforestation program are designed to guarantee an ongoing supply of koa to craftsman for generations to come.

Koa is comparable to walnut in hardness. It is stable, works well (although curly koa can be a little tricky to surface), and takes an exceptionally rich finish with oil or varnish.

We found our curly koa at Eisenbrand Hardwoods. Eisenbrand carries koa and curly koa in thicknesses ranging from 3/8 in. to 2 in. and in widths up to 12 in. Prices vary depending on figure, width and thickness of stock from $12 per bd. ft. to $49 per bd. ft. All of their koa is air dried to minimize drying defects. Air-dried wood is generally too wet to use right out of the box. Eisenbrand provides a tip sheet on how to bring the moisture content of your wood down to acceptable levels. (See also, Q&A, AW #87, June 2001, page 8.) *AW*

Note: Color and figure vary from tree to tree and from board to board. Expect variations in the wood you order.

Source
Eisenbrand Inc. Exotic Hardwoods
(800) 258-2587
www.eisenbran.com

Know of some Great Wood? We'd love to hear about it. Write Dave Munkittrick at dave_munkittrick@readersdigest.com.

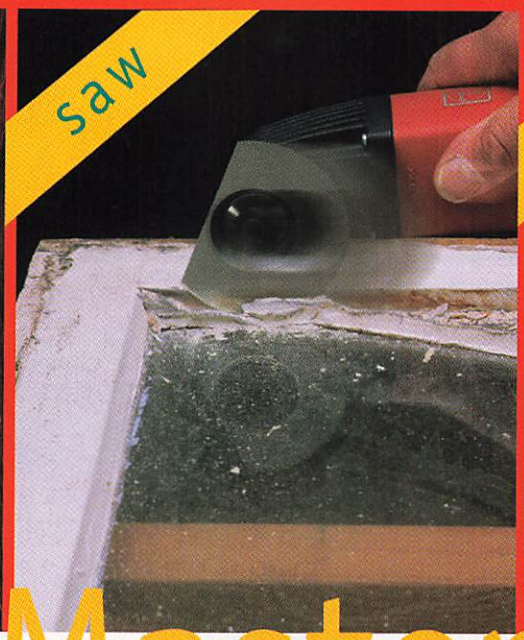
A 7 in. x 24 in. piece of curly koa with a natural oil finish.

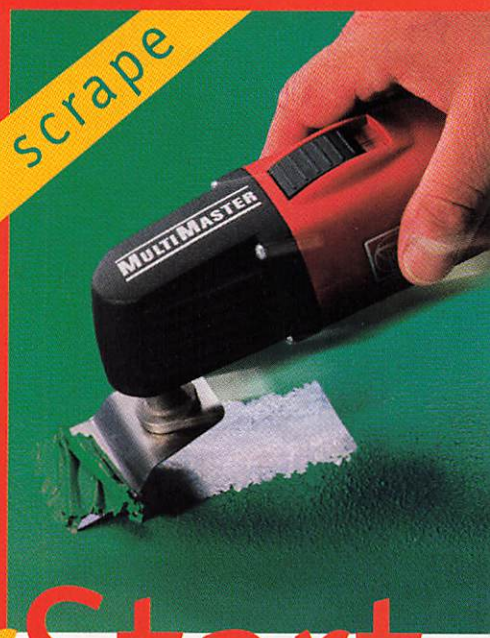
Curly koa's squirrely grain creates a stunning 3-D hologram effect. The lustrous colors of brown, red and orange are accented by irregular dark streaks.

PHOTO BY MIKE HABERMANN

ART DIRECTION: PATRICK HUNTER

The all-in-one tool at a new low price





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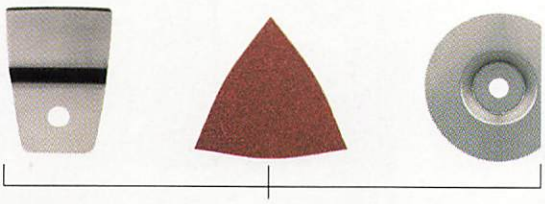
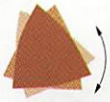


Accessories included

Optional Professional Kit

Go where other sanders can't. Sand into tight corners, along window panes, between shutter slats.

Saw where others fear to go. Cut putty along windows and into corners, undercut door jambs. The segmented blade lets you saw right up to the adjoining surface.



The MultiMaster blade oscillates to prevent kickback, vibration or accidents.

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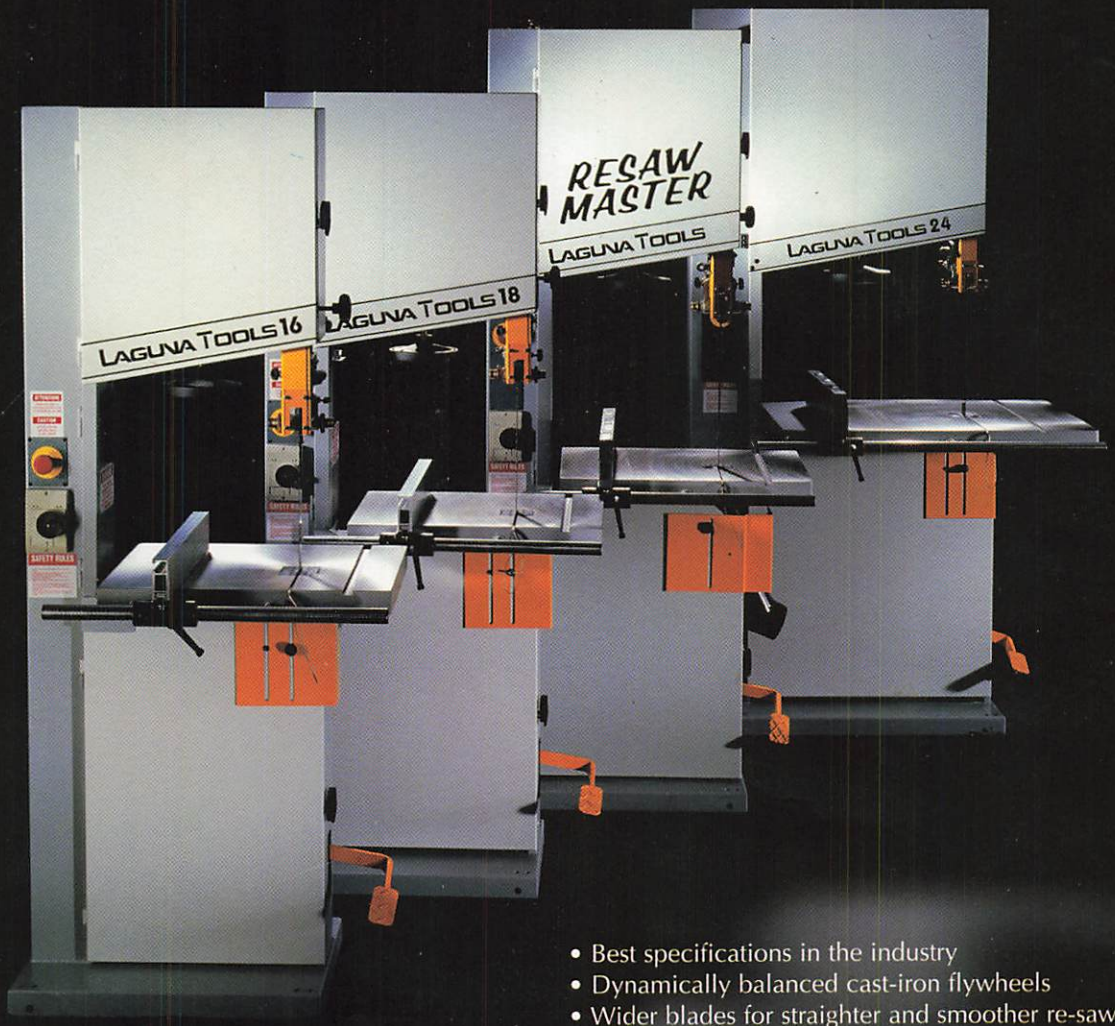
Taking Band Saws to New Levels



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